corresponding with the dorsal margins of the coracoid grooves. From their median junction a less strongly marked ridge runs a short distance postaxiad, a marked fossa existing on either side of it and behind the transverse prominences. Numerous small foramina open round the margins of these fossæ and thence backwards over a considerable part of the internal surface of the sternum. In both species the pleurosteon has six excavations divided by five septa, each of which bears two superimposed convexities for one of the sternal ribs.

In *L. flavopalliatus* the manubrium, when laterally viewed, appears less elongated and less pointed towards its apex. Its anterior surface presents a rounded cup, in the place of an elongated groove, but the tendency to lateral bifurcation is rather more marked. The anterior margin, below the anterior cup, is convex preaxiad.

The internal surface of the sternum has only faint lateral ridges coinciding with the dorsal margins of the coracoid grooves, and there is no postaxiad median ridge, but in its place a large foramen leading into the substance of the bone.

May 7, 1895.

Sir W. H. Flower, K.C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of April 1895:—

The total number of registered additions to the Society's Menagerie during the month of April was 73, of which 42 were by presentation, 6 by birth, 4 by purchase, 1 by exchange, and 20 on deposit. The total number of departures during the same period, by death and removals, was 124.

Special attention may be called to the following acquisitions:—

1. Two specimens of the newly described Irish Stoat (*Putorius hibernicus*) from Wicklow, presented by Viscount Powerscourt, F.Z.S. It has been recently shown (see 'Ann. & Mag. Nat. Hist.' ser. 6, xv. p. 374 (1895), and 'Zoologist,' 1895, p. 124) that the Irish Stoat is a smaller form of the Stoat of Great Britain and requires to be specifically isolated. I exhibit one of the living specimens.

2. Two Mountain Hares (*Lepus variabilis*) from Norway, presented by Mr. O. Gude, April 18th.

3. Three specimens of the peculiar Parrakeet of the Antipodes Islands (*Cyanorhamphus unicolor*), one presented by Sir Walter E. Buller, K.C.M.G., C.M.Z.S., one by W. E. Collins, Esq., and one by the Countess of Glasgow. At the time of the completion of

Count Salvadori's Catalogue of Parrots (see 'Catalogue of Birds in the British Museum,' vol. xx. p. 581) there was but a single specimen of this Parrakeet in the British Museum. The recent voyage of the Earl of Glasgow, Governor of New Zealand, in the 'Hinemoa,' to the outlying islands of New Zealand, has resulted in the acquisition of several specimens of this rare species.

I take this opportunity also of calling attention to the specimens of the Pacific Rat (*Mus exulans*) obtained by the Governor of New Zealand during his recent visit to Sunday Island, Kermadec group, and received March 14, 1895, and presented by the Countess of Glasgow. I exhibit a living pair of this interesting Rat, concerning which Mr. O. Thomas has favoured me with the following note:—

"PACIFIC RAT (*Mus exulans*).

"The Rats from Sunday Island, Kermadec group, apparently belong to a species widely spread over the Pacific, the earliest name of which seems to be *Mus exulans*, Peale [1], based on Fijian examples. It is possible that examples from the different groups of islands may hereafter show certain differences from each other, but, so far as we can see at present, all should be united under one heading. Indeed the fine Maori Rat of New Zealand (*Mus maorium*, Hutton [2]) seems to be very doubtfully separable from the same form, which has probably travelled from island to island in native canoes, or on floating logs &c., long before European ships began to bring over the ubiquitous Grey and Black Rats, which now threaten to exterminate the native species throughout the world."

The following extract from a letter addressed to the Secretary by Dr. Jentink, dated Leiden, April 30th, 1895, was read:—

"There is in the 'Zoologische Garten,' 1890, pp. 266–269, a paper written by Dr. Oudemans, concerning a living Monkey that Dr. Oudemans described as a new species under the specific title *Cercopithecus aterrimus*. In this paper Dr. Oudemans states that '*ausgemacht wurde der Affe sei wirklich eine neue Art.*' I feel obliged to state that the story is not quite correctly told by Dr. Oudemans, for, when he showed me his Monkey, and after I had compared it with the large series in our Museum, I informed him that if the animal was an adult specimen it might belong to an undescribed species; however, if it was a young one I thought it would belong to *Cercocebus albigena*. We could not make out whether all the molars were present or not, as the animal would not allow us to examine its dentition.

"Shortly afterwards it died, and I purchased the cadaver. It

[1] Peale, U.S. Exploring Exped., Mamm. p. 47 (1848).
[2] Trans. N. Z. Inst. x. p. 288 (1878).

was then manifest that it was indeed a young specimen, having the molars still undeveloped, and that it was really a young *Cercocebus albigena*. And under that name I have registered it in my 'Catalogue systématique des Mammifères,' 1892, p. 26.

"The reason why I write you the above is that I read (P. Z. S. 1894, p. 594) that you were unable to say whether a living Monkey in your Gardens from British Central Africa should be referred to *C. albigena*, to *C. aterrimus*, Oudemans, or to a new species. I think that your specimen is either a new species or (as *C. albigena*=*C. aterrimus*) perhaps a young *C. albigena*"[1].

Mr. J. H. Gurney, F.Z.S., exhibited and made remarks on an example of *Alcedo beavani* obtained in Ceylon by Mr. A. L. Butler.

Mr. G. F. Scott Elliot, M.A., F.L.S., F.R.G.S., gave an account of some of the principal animals that he had collected and noticed during his recent expedition to Mount Ruwenzori, in British Central Africa. Mr. Scott Elliot's remarks were as follows:—

The object of my expedition was almost wholly botanical, and I must begin by stating frankly that I have no right whatever to call myself either a zoologist or a sportsman. During my whole expedition I was entirely alone, and I had neither sufficient alcohol nor traps to make extensive collections. Therefore I hope that you will pardon the crudeness and insufficiency of what I have to say.

The most important animal on Ruwenzori is, of course, the Elephant (*Elephas africanus*). On Ruwenzori itself the Elephant is almost always to be seen between a spot called Chukarongo on the eastern side and a few miles south of Kasagamas. On one occasion I saw a hundred together, but usually they go about in small herds of from three to seven or eight in number. They ascend the Nyamwamba and Mubuka valley to about 5600 feet, but not higher, more, I think, on account of the steepness of the mountain-sides above this level than for any other reason. They also occur on the Nyamgassu River, which enters the Albert Edward beyond the Salt Lake, but not, so far as I could tell, on the west side of Ruwenzori; though they are said to be in great abundance on the other side of the Semliki River—which is part of the rich ivory country belonging to the Wanyuema which seems to extend down to at least 5° S. lat.

A short time before my arrival a party of Wanyuema had called at the Salt Lake to ask if they might settle and send their ivory to the coast, *viâ* Uganda. Unfortunately, no European was there, and before any reply could be sent from Uganda the trader, Mr. Stokes, with an enormous caravan, passed up the west bank of the Semliki and probably carried off all the ivory there. It will

[1] [Our specimen of this rare Monkey is since dead, and the skin and skull have been deposited in the British Museum. I agree with Dr. Jentink that it is probably not different from *C. albigena*.—P. L. S.]

be thus seen that there are two sources of supply about the Albert Edward Nyanza, namely the Wanyuema country and that about the east side of Ruwenzori. An organized transport to the Victoria Nyanza and by boat across the lake would enable the Government to obtain the ivory from both these districts.

It may perhaps interest you to hear what is the present distribution of Elephants in East Central Africa.

I first came across their traces in the Mau Forest, where they seemed to ascend to at least 6000 feet. I understand they still exist within two days' journey of Kikuyu to the North-west, and probably from there to Kenia and by Elgon and the Somerset Nile to the Albert Nyanza and Unyoro generally. There are probably considerable numbers in Sotik to the east of my route. They seem to be absent from Buddu and Uganda proper, though in Chagwe, four days from Kampala, some are said to exist. They are probably quite extinct in Ankole, Karagwe, and Mpororo, though there are a few east of Albert Edward Nyanza. There are, however, plenty in Kivari and on the east of Ruwenzori.

There are none along the eastern shore of Tanganyika, and I very much doubt if any are left in the whole of the German sphere of influence, except perhaps about Kilima-njaro.

There are still some herds about the Lake Moero and the western border of British Central Africa, but I fancy they will very soon be exterminated in the Elephant Marsh and Milanje districts.

Hence when the accumulated stores of generations of native chiefs have been exhausted, the supply will enormously diminish.

The Hippopotamus (*H. amphibius*) seems to be rare on the Albert Edward, though it undoubtedly does exist about Kuliafiris. I have also seen the skull of one a long way up the Mubuku valley, where it may have been carried. On the Kagera River their abundance is almost incredible. I do not think I have ever seen 200 yards of the river without hearing or seeing one. The natives call this animal 'ufufu,' which exactly represents its sound. The river flows through strips of papyrus, and the alluvial banks, which are usually 30 feet higher than the level of the river, seem to support plenty of a kind of *Andropogon* grass, of which they are very fond.

The Rhinoceros (*Rhinoceros bicornis*) is more abundant about the marshy lakes of Karagwe than on any other part of my journey. On one day I came across them five times, but, unfortunately, failed to get one.

The Antelopes about Ruwenzori are not very numerous. There are first the ubiquitous Hartebeest (*Bubalis jacksoni* ?), two species of *Kobus*, and at least two Gazelles, one of which appeared to be very like *Gazella thomsoni* of the Masai plains. These Antelopes occur on the wide grassy alluvial plains and low hills under 5000 feet along the eastern side: they are, I think, very rare on the west. They seem to shift their position constantly, owing to the condition of the grass. In April I found quantities of all sorts near

Butanuka, where the grass was about 4 or 5 inches long, and just growing. Passing back over this country in June, when the grass was two feet high and in a dry and withered condition, I saw scarcely any except on places where there had been a fire and young grass was springing up. They probably had gone off to the immediate neighbourhood of the lake. I thought this important, in view of the possibility of cattle-ranching at this point. The Hartebeest, I fancy, is the same which I saw in Buddu and on the Nandi range, probably Jackson's. The Kob (*Cobus kob*), of which I obtained horns, seems pretty common near the Albert Edward. Another Waterbuck, which may have been the Sing Sing (*Cobus unctuosus*), is not uncommon. It has the hair and reddish colour of the Sing Sing, but seemed to me a larger animal and with much larger and broader hoofs than the Sing Sing. Unfortunately, I did not think it worth while to bring home a skin.

In the forest on the Wimi valley, at about 8000 feet, I saw a Bushbuck which I failed to get. This was not the *Cephalophus æquatorialis* (of which I brought the skin and skull from the Victoria Nyanza), nor could it have been the Abyssinian species. It was a very distinctly reddish or bright bay, very much like *Cephalophus natalensis* according to the description.

There are several species of Monkey about Ruwenzori. One of these is a *Colobus*, but I have not been able to identify it. It has the long white and black fur of the *Colobus guereza*, but it is not that species. It might be either *C. caudatus* of Kilima-njaro, or *C. angolensis*, but it seems to me different from the figures of both of them. It is most common in the Yeria and Msonje valleys near Butanuka, but I could not get a specimen. It has a very curious weird screaming cry, quite unlike that of any other animal.

I brought home a specimen of *Cercopithecus pluto* or of the allied form *C. stuhlmanni*. The Wakondja in the Nyamwamba valley, East Ruwenzori, make a sort of pouch or pocket of its skin, which they carry over the shoulder, so that the animal must be common. This Monkey is extremely shy, and usually the only sign of its presence is the noise of a tremendous crash amongst the branches a long distance away. Once I saw very well a troop of another monkey, probably a *Cercopithecus* also. I was alone, of course without a gun, and sitting down very quietly on a fallen tree. Four or five of the older males came quite close after some hesitation. They had white marks on the face, simulating eyebrows, moustache and imperial, and their expression was melancholy and unhappy.

There are also Baboons (*Papio*, sp. inc.) on the Wimi River, where they greatly damage the native crops.

A kind of Lemur (probably a *Galago*), a nocturnal creature living in hollow trees, was the only animal I heard of on the west side of the mountain.

A Squirrel (*Sciurus rufo-brachiatus*) of West-African affinity is common in the Wini valley.

I found amongst the smaller mammals an *Arvicanthis*, allied to *A. abyssinicus*, Rüpp., *Georychus ochraceo-cinereus* of Heuglin, a *Dendromys* allied to *D. mystacalis* of Heuglin, a *Mus* allied to *M. lateralis*, Heuglin. I have to thank Mr. Oldfield Thomas for naming these Rodents and for other kind assistance.

Leopards are very common and a terrible scourge in the eastern valleys of Ruwenzori. In some cases the natives keep within their bomas after 3 P.M. on account of them. One very dark evening two of my men were very severely hurt by them. The animal, after tasting the blood of one of them, leaped in amongst the camp-fires and seized a second.

Lions are also common in the lower ground about Kasagamas. They hide in the neighbourhood of the plantations and carry off the women or solitary men when they come to work.

With regard to birds, I have only brought a few specimens. Of these there are two species of *Nectarinia*. One of them (*N. kilimensis*) is found amongst the bananas at from 5500 to 6600 feet in the valleys along the mountain. It seems to feed entirely on the flowers of the banana, and has a very beautiful reddish-bronze tint. The other, which is much smaller and more gaily coloured, occurs up to 11,000 feet, and seems to feed chiefly on a large Acanthaceous flower which grows in enormous profusion at that height; it also feeds on other characteristic shrubs of that region, chiefly of the same order. The Crowned Crane is extremely common all round Ruwenzori, but particularly in the Semliki valley.

With regard to Reptiles and Amphibia, I understand from Dr. Günther that amongst my specimens there is a new Chameleon represented.

Turning to the insects, a very curious Beetle (*Heliocopus colossus*) of enormous size seems to be very common along the East Ruwenzori in places where Elephants exist. It is found only in their dung, in which it lays its eggs. I also found examples of another species, *H. hamadryas*.

Perhaps I may be allowed to say that, taking the remarks which I have obtained from those who have looked at my zoological specimens, the general impression seems to be that there is at Ruwenzori a meeting-point of two very distinct faunas, one western and the other Abyssinian and Cape. This coincides very closely with my own impressions of the flora. From the mountains of Abyssinia along the east coast—keeping, *i. e.*, at an altitude of 4000 feet—down to Mashonaland there is a flora which becomes gradually more and more like that of the Transvaal. The Shiré Highlands' plants are much nearer those of Mashonaland than one would suppose. The West-African and Congo flora seems to have mingled with this northern flora at Ruwenzori, where one of the valleys, the Wimi, contains many western forms.

I think there is some reason to suppose that the Uganda plateau, or, one might say, the range of Jackson's Hartebeest, is a minor offshoot of this Abyssinian-Cape affinity, of which Somaliland (with Swayne's Hartebeest) represents another offshoot—

Coke's and Lichtenstein's Hartebeests representing the transitional stages to the purely Cape form *Bubalis caama*.

There is a very curious breed of cattle which is the common form in Urundi, Karagwe, and Mpororo, and also occurs sporadically in Buddu. The most singular feature is the enormous horns, sometimes three feet long and as far apart at the tips. The udder is very small and the hump inconspicuous. They are brown all over, not like the other breeds. They have a peculiar way of walking; the fore and hind feet seem to reach the same spot, so that their paths constitute a series of transverse ridges separated by furrows. It seems that they are closely related to the Galla or Sanga Ox of Abyssinia, which were first discovered by Bruce. The Wahima race, which are in a purer condition in this part of Africa than anywhere else, probably brought these animals with them from Abyssinia, and they have probably remained ever since in this country, *i. e.* about 5000–7000 feet in the Urundi hills and also in Mpororo.

The following papers were read:—

1. On the Structure of the Heart of the Alligator. By Frank E. Beddard, F.R.S., Prosector to the Society, and P. Chalmers Mitchell, M.A., F.Z.S.

[Received May 6, 1894.]

We have recently had the opportunity of examining the heart of a large Alligator (*Alligator lucius*), lately living in the Society's Reptile-house. As none of the existing figures of the heart of this Crocodilian, particularly of the valves, appears to us adequate, it seems to be worth while to enter into the matter again. The best and most numerous illustrations of the heart are contained in a work by Prof. Sabatier [1]. None of them, however, shows clearly the relative proportions of muscle and fibrous tissue in the auriculo-ventricular valves, which is a matter of such importance in comparing the hearts of the higher vertebrates. Gegenbaur's well-known paper upon the heart of the Crocodile and the Monotreme [2] has no illustrations at all, while Prof. Lankester [3] has, in our opinion, not given an absolutely accurate figure of the right auriculo-ventricular valve, though the illustration is sufficient to bring out the points with which he was concerned in the paper, which did not profess to be a detailed description of the Crocodile's heart. The heart of the Alligator, as has already been noted, lies exceedingly far back in the abdominal cavity enclosed

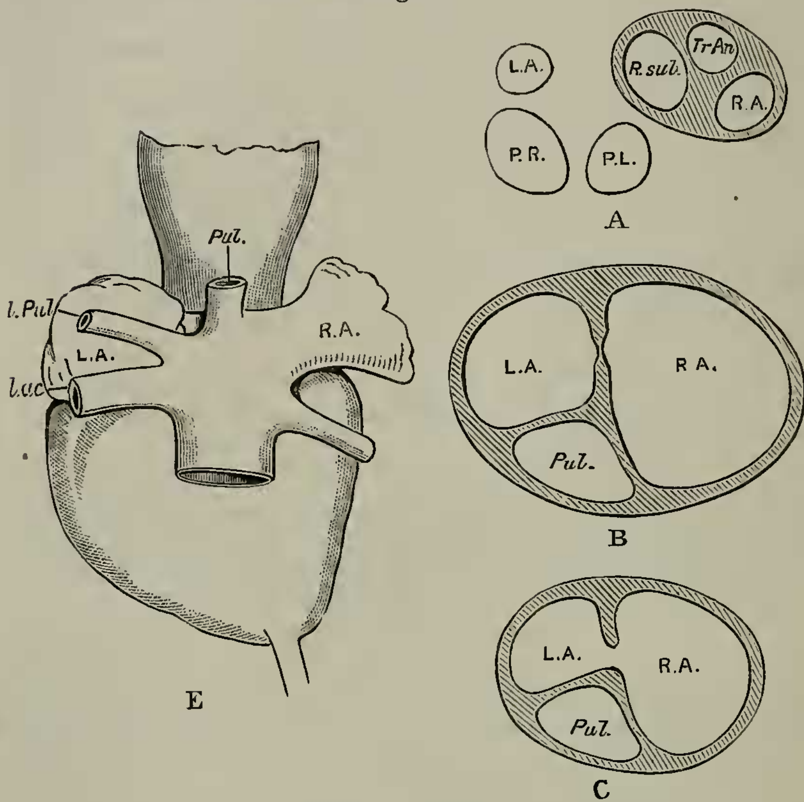
[1] "Le Cœur et la Circulation des Vertébrés," Inaug. Diss., Montpellier, 1873.

[2] "Zur vergleichenden Anatomie des Herzens," Jen. Zeitschr. 1866.

[3] "On the Right Cardiac Valve of *Echidna*, etc.," P. Z. S. 1883, p. 8, pl. iv. figs. 1, 2.

in a stout pericardium of an elastic nature. The pericardium ensheathes the origins of the large vessels, and the point of the ventricles is bound to the posterior end of the pericardium by a stout gubernaculum, as in many Lizards but not in Birds.

Fig. 1.



HEART OF ALLIGATOR.

A, B, C. *Sections through the bulbus at different horizons.*

C. In the region of the aortic valves the communication between the aortæ is shown. B. In the largest part of the bulb; A very narrow window separates the aortæ in one region. A. At the summit of the bulb. *Pul.* Common pulmonary trunk on ventral side: P.R., P.L. Right and left pulmonaries. L.A. Left aorta arising from right ventricle; R.A. Right aorta. *R.sub.* Right subclavian: *Tr.An.* Truncus anonymus.

E. *Dorsal aspect of heart.*

L.A. Left auricle. R.A. Right auricle. The letters *Pul.* are placed upon the base of the arterial bulb: the ventricles, with the gubernaculum attached to the apex, form the lower part of the figure. *Pul.* Right pulmonary vein; *l.Pul.* Left pulmonary vein, which is closely attached externally to the left anterior vena cava, *l.a.c.* The right anterior vena cava opens into the sinus opposite *l.a.c.* The large median vessel is the post-caval.

The accompanying drawing (E) illustrates the dorsal aspect of the heart with the sinus venosus overlying it; the sinus venosus is a very small but distinct thin-walled cavity, in position and arrangement markedly recalling that of the Frog. Anteriorly and to the left side the large left anterior cava opens into it; the much smaller right anterior cava opens opposite to the latter on the right side. The postcaval vein enters the sinus in the middle line posteriorly and is of enormously large size. A large coronary vein leaves the line of junction between the ventricles and enters the postcaval after a short free course.

The two auricles are free from the surface of the ventricles, thus differing from birds; they are attached to the dorsal side of the heart, and their free ends are partially wrapped round but do not meet on the ventral side. The right auricle is markedly longer than the left and its free extremity is forked.

The line of junction between the ventricles is plainly marked exteriorly; and it passes down immediately to the right of the gubernaculum, which is thus attached to the left ventricle only. The great vessels which arise from the ventricles are closely attached to each other and form an enormous bulging expansion anterior to the heart, and showing externally no trace of a division into the separate vessels. The accompanying drawings are illustrative of sections through this bulbus arteriosus at different levels.

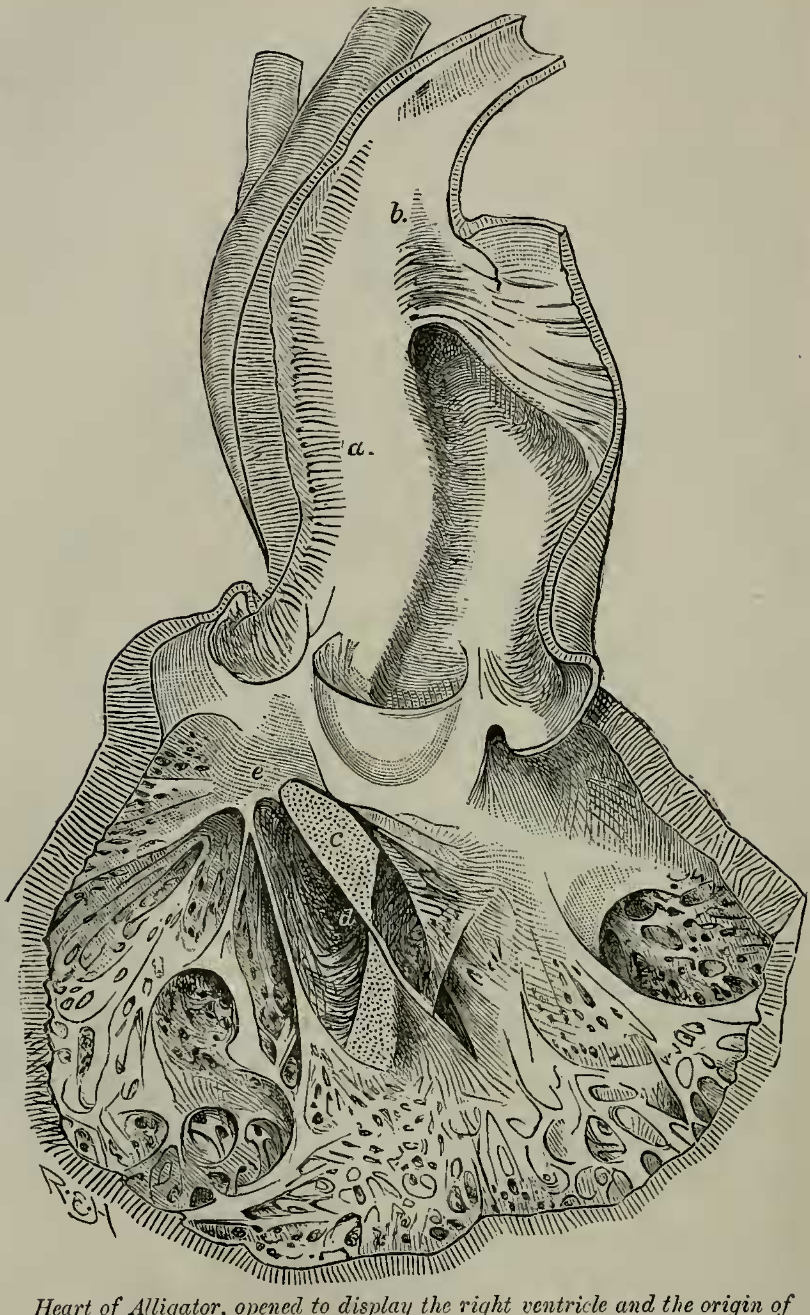
The pulmonary veins enter the dorsal side of the heart towards the left hand; the right pulmonary vein being exactly in the middle line, and the left entering at right angles to it and attached by membrane to the left precaval.

Cavities of the Heart.—The small cavity of the sinus venosus leads directly into the right auricle; the valve between them (atrio-auricular) is bicuspid, being composed of two large thin muscular flaps, each semicircular and like an eyelid in shape; the dorsal valve is slightly overlapped by the ventral at the sides, and the two do not join. The cavity of the right auricle is twice as large as that of the left; the septum between the two is complete and lies in the middle dorsal line of the heart. The interior of both auricles is richly sculptured.

The most striking point, of course, about the interior of the ventricles is the enormous thickness of the spongy walls and the very small amount of free cavity. When the apex was cut off, a well-marked line, concave towards the left ventricle, and situated in the middle of the spongy tissue, showed the boundary of the inter-ventricular septum. The spongy cavities ran closely up to this line, but in no case was it actually penetrated by them. There is in short an absolute separation between the two ventricles.

The *right auriculo-ventricular valve* consists of two separate valvular flaps equal in size; the septal, or inner flap is chiefly muscular, but a triangular piece near the upper free extremity is chiefly membranous, as is shown in the drawing (woodcut fig. 2, *c*). The strand of muscle running along the valve arises by a column with several roots from the septal wall of the heart posteriorly. The right, or outer, valve is entirely muscular (fig. 2, *d*); its upper surface is sculptured, chiefly in vertical lines, and bound to the

Fig. 2.



Heart of Alligator, opened to display the right ventricle and the origin of left aorta.

a & *b*. Two rows of rudimentary valves, the row opposite *b* being shorter and having a deep pit under the lowest of three chief rudimentary valves.

c. Septal flap of right auriculo-ventricular valve; the membranous area is dotted, and a strong muscular band ties down the lower end of the flap to the septal wall.

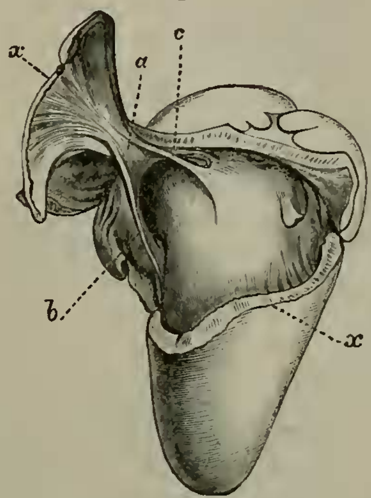
d. Fleshy half of right auriculo-ventricular valve.

e. Muscular band tying down junction of two flaps, and corresponding to bridge in bird's heart.

parietes by delicate muscular threads, which may be compared with the papillary muscles of the valves of the mammalian heart.

In spite of the luminous investigations of Prof. Lankester upon this matter, and of the previously expressed views of one of us[1], we cannot regard the morphological relationship of the different parts of the valve of this animal and that of the bird as thoroughly cleared up.

Fig. 3.



Heart of the Common Fowl, opened to display the cavity of the right ventricle.

x, *x*. Cut surfaces.

b. Right part of the valve identified by us with right part of valve in Alligator (fig. 2, *d*). *c*. Septal part of valve identified by us with Alligator's septal flap (fig. 2, *c*). *a*. Muscular bridge identified by us with structure shown in fig. 2, *e*.

The view taken by Prof. Lankester, and generally accepted, is that the entire fleshy valve of the right (*b*) ventricle of the Bird's heart corresponds to one half only of the complete valve of the Crocodile[2] and of the Mammal; in the Bird it is held that the septal half of the valve is quite absent and not even represented by rudiment. Now, if we consider the Bird's heart in a position exactly corresponding to that of the Alligator as shown in our drawing (fig. 3), this comparison seems to be inexact. The larger half of the valve lies on the right side, and is of course entirely fleshy; in the Ostrich, which we have recently had an opportunity of examining and which was typically avian in every respect, this half of the valve was slightly sculptured on its right face near to the origin from the walls of the heart. A comparison in this matter with the corresponding face of the same valve in the Alligator will

[1] F. E. Beddard, "On the Heart of Apteryx," P. Z. S. 1885, p. 188, and "Notes on the Anatomy of the Condor," P. Z. S. 1890, p. 142.

[2] "Bei Vögeln am rechten Ostium die mediale endocardiale Taschenklappe der Krokodile vollständig geschwunden," Röse, Morph. Jahrb. 1890, p. 80.

be obvious (see fig. 2). As will be seen by an inspection of the accompanying drawing (fig. 3), which we are enabled to reproduce here by the courtesy of Prof. Lankester, this half of the valve is bound down anteriorly to the outer wall of the ventricle by a strong muscular bridge. This muscular bridge is also connected with the anterior edge of another valve which is much shorter than the one just described, but which runs approximately in the same direction as the last, *i. e.* nearly parallel to the longitudinal axis of the heart. This has generally been accepted as part of the longer valve and as not corresponding to the septal flap. We are, however, unable to agree with this interpretation of the structure. In its relations it corresponds exactly to the septal flap of the valve of the Alligator; the upper end of the two valves in the Alligator are in the same way bound down by a strong band of muscle; it is true that this muscle does not form a definite bridge, but it stands out in relief, and as the spongy wall of the ventricle is so much thicker, we cannot regard the obliteration of the space beneath as of any morphological significance: in fact we identify what has been called the inner part of the valve in the Bird's heart as the septal flap of the valve of the Alligator's heart. It is identical in relative position, in its mode of attachment; and in some birds we have seen a slight development of tendon in its substance. Furthermore, the direction of the muscular fibres is not continuous round what has been regarded as the continuous edge of the valve. As to its disproportion in size, we do not see that the amount of development as compared with the nature of the development is a point of much significance.

The left auriculo-ventricular valve, illustrated in the drawing (fig. 4), consists of two separate vertical flaps, of which the septal is considerably larger and overlaps the left flap; the septal valve is thinner, and is composed of both muscles and tendon. The left half of the valve has the free crescentic edge strongly ligamentous, the remaining part being muscular.

The left aorta arises of course from the right ventricle; its exit is guarded by three watch-pocket valves, on the free edge of which are cartilaginous hardenings; the exit is narrow, and the aorta then dilates into a wide chamber in the bulbus. In this are two rows of small sculpturings like rudimentary valves extending to the top of the wide part of the aorta, each row being vertically above the middle of one of the valves (fig. 2, *a*, *b*). The pulmonary artery arises from the same ventricle; its exit is similarly guarded by three valves and it similarly dilates into a wide expansion in the bulbus; the pulmonary artery at the end of the dilatation divides into two branches, which, however, leave the bulbus on its ventral aspect and not, as figured in Wiedersheim, on the dorsal aspect.

The right aorta arises from the left ventricle; its narrow exit is guarded by two wide valves, behind the left of which arises the coronary artery. Behind the right lies the very large communication with the left aorta. The aorta then expands into a very wide sac in the bulbus; in a line with the communication between the two aortæ, and nearly an inch and a half anterior to it, there is a deep pit in the right aorta, shown in the drawing (fig. 1, B). This is separated by a transparent window from the space behind the lowest of the three principal rudimentary valve-like structures in the left aorta; however, there is no actual communication.

Fig. 4.

Heart of Alligator, opened to show the left ventricle and origin of the right aorta.

a. Aperture of coronary artery. *b*. Foramen Panizzi. *c*. Right aortic arch. *d*. Outer or left flap of left auriculo-ventricular valve cut through to show, underlying it, the septal flap of the same valve, which is larger in size, and the membranous margin of which is indicated by the dotted area in the drawing.

2. On the Anatomy of *Chauna chavaria*.

By P. Chalmers Mitchell, M.A., F.Z.S.

[Received May 6, 1895.]

Owing to the kindness of my friend, the Prosector of the Society, Mr. F. E. Beddard, I have had the opportunity of examining the anatomy of a female specimen of *Chauna chavaria*, the Crested Screamer. Garrod (1) has given an account of the anatomy of *Chauna derbiana*; Mr. Beddard and I (2) have published the results of our investigation of *Palamedea cornuta*; but less has been written about *Chauna chavaria*, and I have thought it worth while to examine carefully this third of the three known species of the Palamedeidæ.

External Characters.

The skin was very emphysematous, even upon the tibia, thus differing from *C. derbiana*, but, as in that and in *Palmedea*, there was a triangular space on each shoulder undistended by air.

The number of rectrices was 12, as in *C. derbiana*, not 14 as in *Palamedea*. The wing was aquintocubital as in *C. derbiana* and in *Palmedea* [1].

As Nitzsch states, there is a small aftershaft on some of the feathers on the nape of the neck. This is absent in other regions.

The oil-gland is natiform, and is tufted and covered by feathers. It has two large apertures separated from each other by a narrow line of feathers.

Viscera of Abdomen.

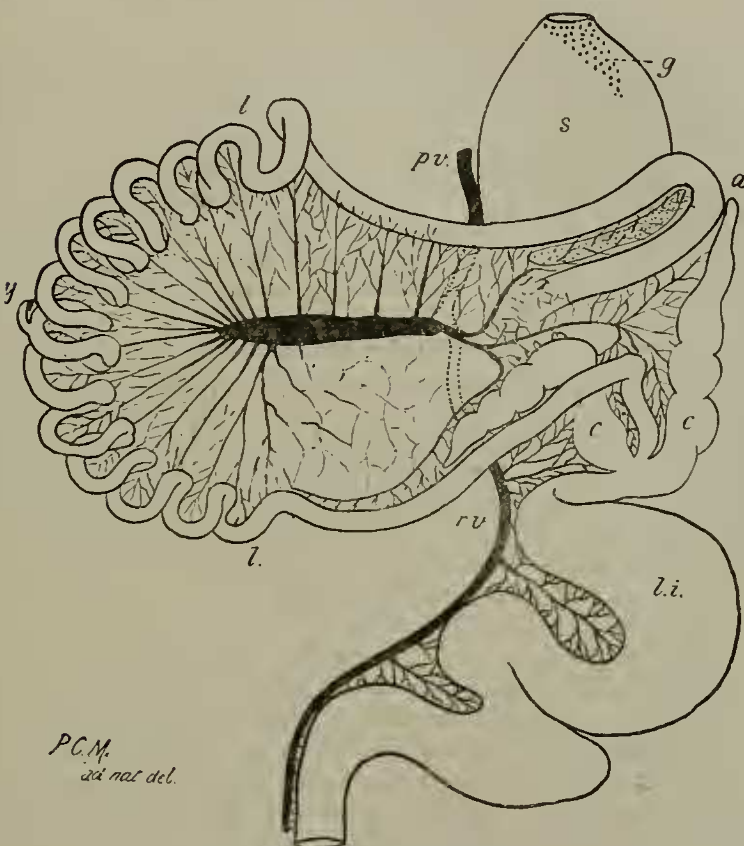
I have little to add to Beddard's description of the septa (3). As in *Palamedea*, the lobes of the liver are not shut off from the subomental space. The falciform septum is nearly median and extends unusually far back, reaching to within half an inch of the ends of the pubes. The horizontal septum was a stout brown membrane attached to the pubes behind and forking over the stomach. The oblique septa stretched from the pubes to the pericardium, and contained numerous striæ in their thick walls.

The lobes of the liver were more nearly equal in size than in *Palamedea*. The gall-bladder was large, and the cystic, hepatic, and single pancreatic ducts entered the summit of the ascending loop of the duodenum exactly as we described in *Palamedea* (2), and not at the position described by Garrod for *C. derbiana* (1).

The proventriculus (*s*) was very capacious, and, as Garrod describes in *C. derbiana*, the glandular area forms a narrow zone round the anterior end and a long triangular patch stretching down on the side. In this respect, certainly, the proventriculus is, as Garrod

[1] In our paper on *Palamedea* (P. Z. S. 1884, p. 536), by an oversight, we stated that the wing was quintocubital. We have examined three specimens and found the fifth feather absent in each.

pointed out, similar to that of the Ostrich; but in the Ostrich the zone is not complete above, and the proventriculus is unsymmetrical in shape. The small gizzard of *Chauna chavaria* exhibited a strongly marked central tendinous area on each of the opposite faces, very dissimilar from the double tendinous area found on each of the similar areas in the Ostrich and Goose.



Intestine of *Chauna chavaria.*

s. Proventriculus with *g* the glandular patch.
d. Duodenum enclosing the pancreas (the duodenum has been turned forwards).
l to *l.* The large loop of the intestine, with *y* the yolk-sac diverticulum about the middle of its length. This coil has also been raised up and turned forwards. The remains of the ventral mesentery running from the diverticulum are not shown, as they lie under the intestinal loop.
c c. The cæca. *l.i.* Large intestine.
r.v. Rectal mesenteric vein. This dips under the mesentery of the large loop, where its course is shown by a dotted line. It there joins with the large central vein of the large loop and with the veins from the duodenum and cæca, and the blood passes forwards, its course being shown by a dotted line, to the portal vein *p.v.*

In the accompanying figure I show the arrangement of the coils of the intestine disposed in a fashion which, from the examination of a number of birds, I have found to be most instructive. The intestines were removed bodily from the abdominal cavity after division of the œsophagus and of the rectum in front of the cloaca. They were then placed on the table with the ventral side upwards, and with as little disturbance as possible the overlying folds were turned outwards. The duodeum (*d*) is a short loop enclosing the pancreas in the usual fashion. Then follows a very long small intestine (*l–l*) suspended at the circumference of a nearly circular expansion of the original straight mesentery running from the liver to the rectum. This loop of the intestine corresponds in position and arrangement to the anterior of the two enormous loops which compose the gut behind the duodenum in the Ostrich. It also corresponds to the five or six more specialized loops found in the intestine of Anatidæ, but remains in what appears to be a more primitive condition. At the end of the first large loop the intestine passes into the large intestine and the cæca are attached at the point of junction. The cæca in my specimen were different from those of the *C. chavaria* described by Beddard (**3**), in that they were nearly equal in size and much more sacculated than in the figure given by Beddard. The right cæcum was closely bound to the distal part of the great loop of the intestine running forwards along it. The left cæcum was attached to the descending loop of the duodenum, and in the figure is represented as turned forwards along with that.

The rectum, as in *C. derbiana* and *Palamedea*, was very long and wide, although not nearly so long relatively as in the Ostrich. I do not give the measurements of the parts of the intestine, as from my own observations, and still more from the extended observations of Garrod, Beddard, and others, it seems that the amount of individual variation makes comparisons of little value.

Attached to the free or primitive ventral side of the large loop of the intestine, and nearly in the middle of its length, was a small cæcum (*y*), the remains of the original yolk-duct. From the point of this a short ventral mesentery with a thickened edge ran forwards towards the liver. In the Ostrich the remains of the yolk-sac lie in the same relative position, and I have found in that the remnant of a similar ventral mesentery.

A large number of radial veins leave the large loop of the intestine and converge upon an elongated, much expanded, large tributary of the portal vein. This runs inwards in the middle of the circular mesentery opposite the yolk-sac diverticulum. It is joined by a branch from the right cæcum and from the distal part of the loop; next, by one from the left cæcum, next by one from the duodenum.

Another large vessel from the large intestine joins these vessels, and from their meeting-point the large mesenteric vein joins with a small splenic vein and runs forwards as the portal vein. I may mention that the disposition of these vessels is similar in the Ostrich.

Windpipe.

I have little to add to Beddard's description of this organ (3). The two pairs of extrinsic muscles were as he found them. The syrinx was notched only at the back, as in *C. derbiana*. None of the bronchial semirings were ossified.

The Heart.

This organ was typically avian. The only peculiarity worth noting was in the right auriculo-ventricular valve. In the smaller part of the valve, which Beddard and I have identified with the septal flap of the Alligator's similar valve, I found a small tendinous area. The edge of the flap was muscular, one strand of muscle running to the bridge of muscle which binds the two flaps to the wall of the ventricle. Another band of muscle passed from the lower edge of the valve to the septal wall of the ventricle, exactly as in the Ostrich and in the Alligator.

The Buccal Cavity.

The tongue was identical with that of *C. derbiana*, as described by Garrod.

Between the rami of the mandible, anterior to the *mylohyoid anterior*, lay a pair of large pear-shaped glands opening into the floor of the mouth at the anterior end, just behind the lower beak, by a number of small apertures on each side of the middle line.

Myology.

In my account of this I shall follow the description recently given by Beddard and myself of the myology of *Palamedea* (2), as in the main the two birds are very closely alike.

In the muscles of the neck and trunk the only point worth noting is that the new muscle described by us as the *costo-sternalis externus* was also present in *Chauna chavaria*. It arises by a flat tendon from the third, fourth, and fifth ribs and is inserted to the costal edge of the sternum, less than half an inch from the posterior end. As in *Palamedea* it may be taken as replacing physiologically, to a certain extent, the absent uncinate processes.

Head-Muscles.

Dermo-temporalis and *biventer maxillæ* as in *Palamedea*. *Digastric* or *depressor mandibulæ*, as in *Palamedea*, consists of two parts. The external portion arises by a strong tendon from behind the external auditory meatus; it runs downwards and forwards, and is inserted fleshy along the upper edge of the angulare. The inner portion is almost entirely tendinous; its origin is below that of the outer portion and its insertion is to the ventral and median side of the origin of the angular process.

Temporalis consists of four clearly separated portions. The most external portion is the largest. It arises fleshy from a curved line over the ear from the posterior edge of the orbit to the edge of the *biventer maxillæ*. Its fibres run downwards and forwards under the maxilla, to be inserted along the inner edge of the mandible. The second portion is the most anterior. It is a comtively narrow band, strongly tendinous, passing from the posterior inner wall of the orbit near the postorbital process: its fibres run downwards and outwards, and, passing under the maxilla, are inserted into the mandible internal to the first portion. The third portion lies behind the second, and is shorter. It arises from the under edge of the orbital process of the quadrate, and, passing parallel to the second portion under the maxillary bar, is inserted into the inner side of the mandible.

The fourth portion does not act as an elevator of the lower jaw. It is a broad fleshy mass, deep within the orbit, passing from behind the optic foramen to the upper and inner edge of the orbital process of the quadrate.

Pterygoid. The first portion is muscular only at its origin from the internal articular process of the lower jaw. It becomes a strong superficial band of tendon, which in front spreads out in the strong membrane covering the palate. The second portion is a broad muscular mass arising from the internal articular process all along its length. The fibres run forwards and are inserted to the pterygoid and the ventral surface of the palatal bones. The third portion is a broad mass external to the second; it arises from the inner face of the lower jaw behind the second portion, and running forwards and inwards is inserted to the outer and upper surfaces of the palatal bone.

The Hyoid Group.

Mylohyoid anterior. The two divisions seen in *Palamedea* were not marked: the muscle, which was well marked, arises from the inner side of the lower jaw anterior to the region of the basihyal. The fibres run straight across the surface of the lower jaw and meet their fellows of the other side in a median raphé. Some of the posterior fibres spread out as a diffuse sheet.

Mylohoid posterior. The origin was as in *Palamedea*. The posterior thinner portion was exactly as in *Palamedea*, where we described it as a *platysma myoides*. The narrower anterior portion was a stout ribbon of muscle running forwards and inwards superficial to the ceratohyal, to be inserted to the inner surface of the base of the cornu and to the outer surface of the urohyal, in fact to the angle formed by the meeting of these two parts of the hyoid apparatus.

Geniohyoid. As in *Palamedea* this muscle was wrapped round the posterior portion of the cornu of the hyoid, and then passed forward to be inserted to the inner surface of the lower jaw behind the *anterior mylohyoid*.

Genioglossus absent, as in *Palamedea*.

Ceratoglossus. Only the second part present, and that was as in *Palamedea.*

Ceratohyoid as in *Palamedea.*

Hypoglossals. There is a well-marked *hypoglossus rectus* arising fleshy at each side from the entoglossum, and ending in a long tendon running forward to the tip of the tongue. Undoubtedly this muscle is what we described as the first part of *ceratoglossus* in *Palamedea.*

Thyrohyoid. A well-marked muscle at each side arising from the side of the basihyal and spreading out over the thyroid cartilage. This we described in *Palamedea* as belonging to the system of the sternohyoid.

Caudal Muscles.

The five muscles were exactly as in *Palamedea*, except that the inner thinner portion of the *ilio-coccygeus* was absent.

Muscles of the Shoulder-girdle.

Rhomboideus externus and *internus*, *serratus anticus*, *pectoralis minor*, *sterno-coracoid, coracobrachialis longus*, *coracobrachialis anterior* and *c. internus, deltoides minor*, *teres major*, *subscapularis*, *expansor secundariorum*, *biceps*, *triceps, extensores metacarpi radialis* and *ulnaris*, *ectepicondylo-ulnaris* and *radialis*, *extensor digitorum communis*, *extensor indicis longus*, *pronator sublimis*, *brachialis inferior*, *flexor digitorum sublimis*, *ulni-metacarpalis ventralis*, *abductor pollicis*, *flexor pollicis*, *abductor indicis*, *flexor digiti III.*, and *interossei dorsalis* et *palmaris* were as we described them in *Palamedea.*

Serratus posticus. The origins were a rib further back than in *Palamedea.* *Pars metapatagialis* arose from the sixth complete rib. Part two came from the fourth, fifth, and sixth ribs.

Latissimus dorsi differed from that in *Palamedea* only by the absence of a metapatagial slip from the tendon of insertion of the posterior part.

Pectoralis major arose partly from the posterior sternal rib.

Coracobrachialis brevis (*subcoracoideus*) was represented only by a ligament.

Deltoides major was not divided into two portions, and the upper region of its insertion was not tendinous.

Patagialis arose as in *Palamedea*, and the general disposition of the tendons was as in *Palamedea.* But, as Fürbringer has already figured, the *brevis* ligament unites not only with the *extensor metacarpi radialis*, but passes over to the ulna. As in *Palamedea* there is no *biceps patagialis.*

Teres minor (*supraspinatus*) was not present.

Anconæus longus. This is as in *Palamedea*, but there were no tendinous bars, uniting the tendons of the head and of the accessory head.

Extensor longus pollicis. The ulnar head was very small and had no tendon.

Pronator profundus was larger than *pronator sublimis.*

Flexor digitorum profundus reached nearly to the tip of the second phalanx of digit II.

Flexor carpi ulnaris. The sesamoid was not ossified.

Extensor brevis pollicis arose by two fleshy digitations from the dorsal face of metacarpal I. It was inserted to the base of the thumb.

The second *abductor pollicis*, described by us in *Palamedea*, was not present.

Radio-metacarpalis ventralis absent.

Ulni-metacarpalis dorsalis, not found by us in *Palamedea*, present. The origin is a strong tendon from the distal end of ulna on its dorsal surface near the radius. It divides into a series of digitations, the most radial of which is inserted by a tendon to the base of metacarpals II. and III., the others fleshy to the ulnar side of metacarpal III.

Muscles of the Thigh and Leg.

Sartorius, *glutei anterior*, *medius*, *minimus*, *quartus*, *pectineus*, *vastus externus*, *cruræus*, *vastus internus*, *biceps*, *obduratores externus et internus*, *gemellus*, *ambiens*, *soleus*, *tibialis anticus*, *extensor communis digitorum*, *flexor perforatus et perforans medii*, *flexor perforatus*, *flexor profundus*, *popliteus*, *flexor brevis hallucis*, *flexor brevis hallucis secundus*, *flexor brevis indicis*, *extensor hallucis*, *extensor hallucis secundus*, *abductor indicis*, *extensor medii*, *abductor annularis*, are all as in *Palamedea*.

Glutæus maximus. The representative of the postacetabular part of this muscle found by us in *Palamedea* is absent.

Femoro-caudal. There was only a tendon of origin: the insertion in the tail was fleshy.

Accessory femoro-caudal. This muscle, absent in *Palamedea*, is present in *Chauna chavaria*. Garrod states that it is present also in *C. derbiana*.

Semitendinosus. The accessory is larger than in *Palamedea*. The tendon from the two heads joins the inner head of the *gastrocnemius*, not the middle as in *Palamedea*.

Semimembranosus. The tendon of this, after receiving a slip from the tendon of the *semitendinosus* as in *Palamedea*, runs into the tibia between the inner head of the *gastrocnemius* and the *accessory semitendinosus*.

Adductors. There is not so great a difference in size between the two adductors as in *Palamedea*. The origin of the deeper *adductor* extends also to the end of the pubis. As in *Palamedea*, one set of the fibres are inserted to the femur; the other set join, not the middle head of the *gastrocnemius*, but the accessory *semitendinosus*.

Gastrocnemius. The outer head is as in *Palamedea*. The middle head is slender, but is quite distinct from the *accessory semitendinosus*; it arises tendinously from the intercondylar notch and it joins the outer head of the *gastrocnemius* halfway down the leg. The inner or tibial head arises from the internal condyle of the femur in addition to the origin found in *Palamedea*.

Peroneus longus. The fork to the ankle-cartilage consists of four separate branches, becoming wider from above downwards.

Peroneus brevis. The tendon of insertion forks—part, as in *Palamedea*, being attached to a knob on the outer side of the tarso-metatarsus, part going to the fascia covering the ankle-joint.

Flexor perforans et perforatus indicis has an additional origin from the end of the tibia.

Flexor longus hallucis. The general arrangement is as in *Palamedea*, and the slip to the toe from below the vinculum, which we found in *Palamedea*, but which Garrod did not find in *C. derbiana*, is present in *C. chavaria.* The vinculum consists of two slips.

Abductor annularis is as in *Palamedea*, but in our paper we called two muscles the *adductor annularis.* The first of these is the abductor.

Skeleton.

I add a few notes on the points of difference and resemblance in the skeletons of *Palamedea* and the two *Chaunas.* In *Palamedea* the whole skeleton is the slightest of the three, and its long bones are the longest. *C. derbiana* has the heaviest skeleton and its long bones are the shortest. *C. chavaria* is intermediate.

Sternum. *C. chavaria* has the posterior lateral processes shortest; *Palamedea* intermediate; *C. derbiana* longest and most anserine. In the *Chaunas* the inner anterior surface of the sternum is pneumatic. It is not so in *Palamedea.*

Vertebræ and Ribs. In *Palamedea* and *C. chavaria* there are 16 cervical vertebræ without movable ribs; in *C. derbiana* 17. Then follow two dorso-cervicals with free movable ribs, the 17th and 18th in *Palamedea* and *C. chavaria*, the 19th in *C. derbiana.* Then follow complete ribs articulating with sternal ribs; 7 on vertebræ 19 to 25 in *Palamedea*; 8 in *C. chavaria*, on vertebræ 19 to 26; 8 in *C. derbiana*, on vertebræ 20 to 27. Lastly, there follows an incomplete rib, of which the articular surfaces are much reduced, and which meets a sternal rib that is attached not to the sternum, but by a fibrous connection to the side of the preceding sternal rib. In *Palamedea* this is borne on the 26th vertebra; in *C. chavaria* upon the 27th; in the skeletons of *C. derbiana* that I have seen it was not present, but its attachments are so slight that it might easily have been lost in maceration. In *Palamedea* the rib on the 23rd vertebra is the most anterior covered by the ileum; in the *Chaunas* it is the 25th. In *Palamedea* and *C. chavaria* the thirty-first is the last vertebra with a transverse process anterior to the acetabulum; in *C. derbiana* the corresponding vertebra is the *thirty-second.*

In *C. derbiana* the penultimate sternal rib has a sharp backwardly directed process near the articulation with the costal rib; this is absent in *Palamedea* and in *C. chavaria.*

Clavicle is V-shaped in *Palamedea*; U-shaped in the *Chaunas.*

Pelvis. The waist is broad in *Palamedea*, narrow in *C. derbiana*, intermediate in *C. chavaria.*

The hinder part of the pelvis is bent downwards upon the fore part in *Palamedea*; it is nearly straight in *C. derbiana*; the angle of inclination is intermediate in *C. chavaria*.

In all three, the pubes do not extend far behind the ischia, and the forwardly turned processes, which in so many *Anatidæ* nearly meet in the middle line and recall the median ventral symphysis of the Ostrich, are absent.

THE SKULL in its general proportions resembles that of *Palamedea* more than that of *C. derbiana*. It has most of the features given in our table (2) as common to *Palamedea* and *C. derbiana*. The foramen magnum is relatively smaller than in *Palamedea*, as in *C. derbiana*. The outer long edge of the palatine is not sharply angular, as in *Palamedea* and *C. derbiana*. The width of the middle superior ramus of the premaxilla is nearly uniform, as in *Palamedea*, not wider at its origin than posteriorly, as in *C. derbiana*. The angular process of the lower jaw is not so straight as in *Palamedea*, nor so sharply upturned as in *C. derbiana* and Geese.

The hyoid. The *basihyal* is unlike that of *Palamedea*, being short and roughly triangular, the apex being anterior. The *urohyal* is long and cartilaginous at its extremity, as in *Palamedea*; but it is anchylosed to the *basihyal*, instead of being freely movable upon that. The *entoglossum* consists of two completely separate paired ossifications.

The *ceratohyals* are stouter than in *Palamedea*, but, as in that bird, consist of two bony pieces with an intermediate cartilaginous segment.

PAPERS QUOTED.

(1) GARROD. "On the Anatomy of *Chauna derbiana*." P. Z. S. 1876, p. 189.
(2) BEDDARD and MITCHELL. "On the Anatomy of *Palamedea cornuta*." P. Z. S. 1894, p. 536.
(3) BEDDARD. "On the Anatomy of *Chauna chavaria*." P. Z. S. 1886, p. 178.

3. Field-Notes on the Antelopes of the Transvaal. By Dr. PERCY RENDALL, F.Z.S.[1]

[Received February 25, 1895.]

THE REEDBUCK. *Cervicapra arundinum*.

Zulu: *Imsigi* or *Umsagoko*. Swazi: *Ihlangu*.

This animal is to be found in the damp and reedy places along the banks of the Lompangwana River, but it is hard to get a clear shot, in tall rank grass and reeds that are much higher than your head, the stems of which are the thickness of a cedar pencil. Its

[1] [Dr. Rendall has at my request kindly put together these notes, which he made on the Antelopes met with in the Transvaal in 1893 and 1894.—P. L. S.]

flesh is coarse and rank, and I think none but natives would eat it for choice.

The Lesser Reedbuck. *Cervicapra lalandii.*

Swazi: *Njala* or *Ihlangu matse.*

This second name signifies the "Reedbuck of the Rocks." Nothing could better describe its haunts, which are always on the hill-sides, and not in the creeks. The Colonial and Boer name for this animal is always the Rooi Rhebok. It is common in the De Kaap district, in pairs or small parties of some four or five individuals. Always wary, and frequenting the bare mountain-sides, it is hard to shoot. Its flesh is excellent, as I can testify.

The Bushbuck. *Tragelaphus sylvaticus.*

Zulu and Swazi: *Inkonka* ♂, *Imbabala* ♀. Shangaan: *Shomo.*

This graceful antelope is to be found in many of the wooded kloofs of the De Kaap district. The adult male are very dark in colour compared with the chrome-yellow of the female. The white spots appear to have a similar arrangement in both sexes.

The neck of the male is nearly devoid of hair. The buck, at bay or wounded, is really dangerous, with its sharp, strong, straight horns; a Swazi of ours had two large dogs killed in as many minutes by an animal which they attacked together.

It is difficult, even with a systematic beat, to drive this antelope from cover, as it doubles and dodges till the last moment. The thickly wooded beds of streams are often chosen by them as a habitat. At night I have frequently heard their sharp hoarse bark, emitted, I believe, only by the males.

The Inyala. *Tragelaphus angasi.*

The Dutch call this animal the Bastard Koodoo. I got a good series of horns of this rare animal from the River Iembé, which runs into the south side of Delagoa Bay. I know of it from no other locality.

The Pallah. *Æpyceros melampus.*

Shangaan: *Impaya.*

This beautiful antelope we found in great abundance between the Sabi and Krokodil Rivers, often in herds numbering some hundreds, in the belt of country infested by the tsetse fly. In March the females and their half-grown young were in separate herds from the males, which were always in troops distinct from one another. Their skins at this period of the year were at their best, the two shades of brown being very distinct.

They formed the principal food of the lions which were plentiful in this district, and we were constantly coming across their remains. Acting as scouts they often prevented our getting shots at larger game which we were busy stalking. Most commonly we found them in company with Blue Wildebeeste and Burchell's Zebra. Their flesh is excellent eating, and formed our staple food.

They have a curious habit of stamping with their feet; the peculiar meaning of this we were unable to settle: their alarm-note, for want of a better term, may be described as a whistle. In this part of the country you always get the smaller form, described as a separate species by Mr. Oldfield Thomas—perhaps, as it is wooded, "thorn veldt" country.

Sometimes we found white patches on the hocks, and in one instance a black patch on the snowy-white chest between the fore legs. When frightened by any sudden noise they made most prodigious bounds into the air, like a Springbuck; and when it was not necessary to shoot them, I have derived great pleasure from these exhibitions of saltatory agility.

The Rehbuck. *Pelea capreolus.*

Zulu: *Iza.*

This antelope is extremely wary, and from the sentinels they post it is especially hard to approach, as they frequent the very highest ridges, which are destitute of cover. Their alarm-note is a sort of harsh cough, upon which all take flight. They still linger on the highest ridges of the Makongwa Range near Barberton. Their flesh is so constantly affected by a species of warble that it is practically uneatable.

Blue Wildebeeste. *Connochætes taurinus.*

Swazi: *Inkonkone.*

Between the Sabi and Krokodil Rivers this animal exists in considerable numbers. It is often found associating with the Pallah, and also at times with Burchell's Zebra.

It is very fond of making wallowing-places in soft and moist ground, where it kneels and rolls. Trees, such as mimosas, are selected as rubbing-posts, and its horns especially are often found to be much worn down by this constant process.

An old bull we shot had actually exposed the core of his horns in this manner. When charging past you they have a very ferocious aspect, which their behaviour belies; they remind one of a small American Bison, the great disparity of height at the withers and the sloping quarters, together with the mane, are responsible for this likeness. The flesh is uneatable. In a troop of this species, one possessed a pure white tail: a lion which we were following prevented us from shooting this interesting variety. (The White-tailed Gnu, *Connochætes gnu,* is unknown in this part of the Transvaal.) The old bulls of this species, *C. taurinus,* are very often solitary, whereas the other adults of this species are gregarious, generally in small herds of about eight to twelve individuals. That curious odoriferous gland in the fore-foot of the animal seems to be a sexual characteristic.

THE STEINBUCK. *Neotragus campestris.*

Shangaan: *Shipeni.* Swazi: *Njena.*

This species is common in the open flats of the Barberton district on the rolling grassy slopes, haunting the same spots. Startled, it rushes off with rapid bounds at a great pace at first, but at a distance of a hundred yards or more, if not shot at or pursued, will often stand and have a good look at you. With good dogs and a steady shooting horse they can be readily bagged with a shot-gun loaded with S.G. The white tail is very noticeable as it retreats. Its flesh is very palatable.

A variety, which has the local name of the Grys Steinbuck, is found near the Lebomo Mountains. It appears to have coarser hair and shorter legs than the above-mentioned species.

THE GRYSBUCK. *Neotragus melanotis.*

This little animal is found north of the Sabi River as far as the Murchison range, sparingly over the intervening tract of country—the eastern and north-eastern portion of the Transvaal.

THE ORIBI. *Neotragus scoparius.*

Zulu: *Iula.*

This small antelope is now rare in the De Kaap valley near Barberton, and though sportsmen tell me it used to be found in great numbers, yet now it only occurs in pairs, and frequents favourite spots on the higher ridges apart from human habitations or traversed paths. When startled it gives great leaps into the air, and is easily knocked over with a 12-bore and large shot. Its flesh is good, and very pleasant as a stew in particular.

THE KLIPSPRINGER. *Oreotragus saltator.*

Swazi: *Ikoka.*

This quaint little hill-climber is everywhere sparingly distributed over the De Kaap district, wherever the ground is rocky and suitable. On 23rd April, 1894, I had a curious proof of its self-possession, for passing in the Pretoria and Delagoa Bay train, through that wild and rocky defile known as Krokodil Poort, I saw within 15 yards of the train, which was travelling at full speed, two of these small antelopes, which were regarding us most unconcernedly. When frightened, they go over the roughest ground with unerring jumps.

A captive doe which I saw was dangerous to children. On 10th June, 1893, I dissected a female that contained a $\frac{3}{4}$-grown fœtus. When shot, a slight fall will bring its coarse and bristly hair out, literally in handfuls—a fact that I have never seen satisfactorily explained, caused, as it is, by a most trivial blow or friction in falling.

ROAN ANTELOPE. *Hippotragus equinus.*

Zulu: *Takayezi.*

There were a few of these fine animals on the Oliphants River in the Transvaal. A Boer called one that he had shot a "Bastard Gemsbok," though they have a knack of styling it the "Bastard Eland" also.

THE HARTEBEESTE. *Bubalis caama.*

Zulu : *Indhluzela.*

There are a few of these antelopes on the banks of the Krokodil River, opposite Hector's Spruit, and also in the East Lydenburg District of the Transvaal and in South Gazaland.

SABLE ANTELOPE. *Hippotragus niger.*

Zulu : *Impal-impala.*

Some of these glorious antelopes still linger between the Sabi and Krokodil Rivers, but, as far as we could ascertain, there was only one small troop.

THE BLUEBUCK. *Cephalophus monticola.*

Zulu : *Inpiti.* Sangaan : *Inhlingwaan.*

The feet of this tiny antelope I obtained from a necklace that a native was wearing in the Barberton district of the Transvaal; but I do not believe it is found nearer than Natal, where I got it from the River Umsinkulu. A smaller form (*C. natalensis*?), which is red in colour, is found to the north of Delagoa Bay.

THE DUIKER. *Cephalophus grimmi.*

Zulu and Swazi : *Impunzi.*

This is by far the commonest and most widely distributed of all the small antelopes in the eastern portion of the Transvaal which abuts on Swaziland. Hills and plains, wooded slopes of dongas, and elsewhere this is the first and last species you will see. Its protective resemblance to its surroundings is perfect, and until it moves it is invisible to the keenest sight. The vitality it possesses is proverbial. The flesh is good eating. One case I know of, all four feet were shot away with a charge of buck-shot, and yet it went a hundred yards, until a dog pulled it down. A Martini bullet, unless in a vital spot, will not stop it.

It is easily tamed, and makes an attractive little pet; but the males, when their horns grow, are fearless and even vindictive: a tame buck raised by a friend of mine put his horns first through his hand and then through his thigh, and had to be shot. I know of one instance in which, with both parents captive, a young one was successfully reared. Their skins vary in every conceivable tint of grey and brown in the same district, and are very commonly used by the Swazis for making their "mutyas," or fur girdles.

4. The Skeleton of *Lorius flavopalliatus* compared with that of *Psittacus erithacus*.—Part II. By St. George Mivart, F.R.S.

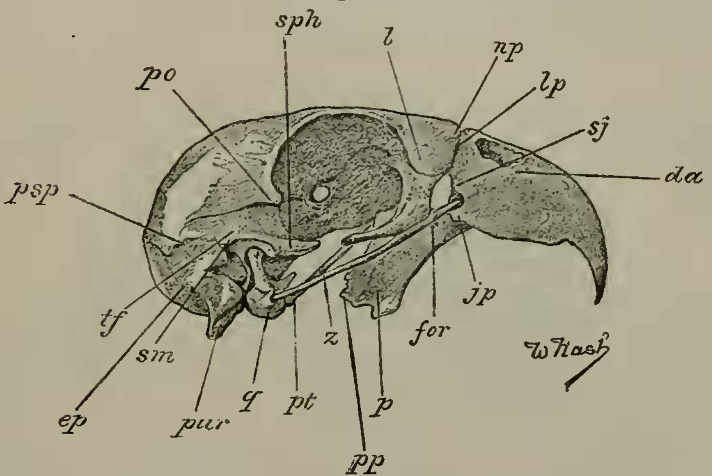
[Received May 1, 1895.]

In a preceding paper[1] I described the postcranial part of the axial skeleton of *Lorius flavopalliatus* and *Psittacus erithacus*. I now proceed to describe the characters presented by the skulls of those two species.

The Skull.

General Description.

Fig. 1.



Lateral aspect of skull of *Lorius flavopalliatus*.

da. Prenasal surface (here not depressed).
ep. Exoccipital prominence.
for. Foramen in palatine.
jp. Jugal process.
l. Lachrymal, constituting the preorbital prominence.
lp. Lachrymal process of prosopium.
np. Nasal process of frontal.
p. Inferior palatine ridge.
po. Postorbital process.
pp. Postaxial, or posterior palatine, process.
psp. Postsquamosal prominence.
pt. Pterygoid.
pur. Paroccipital process.
q. Quadrate.
sj. Suprajugal process.
sm. Suprameatal process.
sph. Sphenotic process.
tf. Temporal fossa.
z. Zygoma.

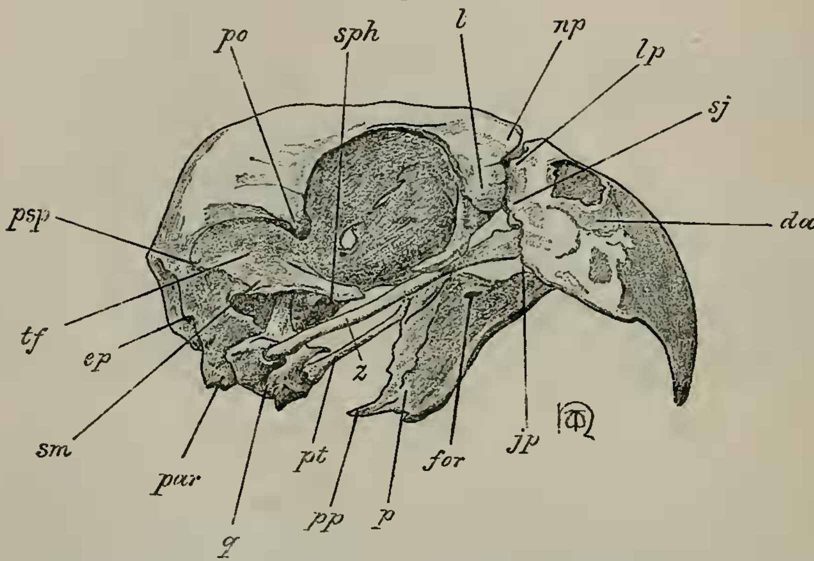
The general lateral aspect of the skull of *Lorius flavopalliatus* (compared with that of *P. erithacus*) shows a cranium rather more flattened, a relatively somewhat more slender and elongated bony beak, a more nearly enclosed orbit, palatines which do not descend beyond the level of the ventral margins of the quadrates, an occiput which is less rounded and more sharply inclined preaxiad

[1] See P. Z. S. 1895, p. 312.

above the lambdoidal ridge but more rounded and projecting below the latter, and paroccipital processes more sharply inclined backwards and also more distinct from the relatively smaller quadrates.

THE GENERAL DORSAL ASPECT of the skull (see fig. 3, p. 367) shows, compared with that of *P. erithacus*, a relatively short bony beak on account of the sharp vertical deflection of the latter towards its apex. The skull behind the cranio-facial articulation is flatter and the orbits somewhat more deeply incised, the deepest part of the incision being more preaxially situated in the orbital margin. The middle part of the hinder (occipital) margin presents a slight median concavity instead of an evenly and very slightly curved convexity. The dorsum of the skull is flatter antero-posteriorly than in *P. erithacus*.

Fig. 2.



Lateral aspect of skull of *Psittacus erithacus*.

da. Depressed area in front of nasal aperture.

(The other letters the same as in fig. 1.)

THE GENERAL VENTRAL ASPECT (see figs. 6 & 7, p. 378) of the skull of *L. flavopalliatus* is very similar to that of the skull of the Grey Parrot, but, as in the dorsal view, the bony beak forms a less proportion of it, as does the space occupied by the palatines, while the *basis cranii* is relatively more antero-posteriorly extended, the quadrates more anterior in position, while the very elongated lachrymal processes extend beside the zygomata for much more, instead of much less, than half the antero-posterior extent of the latter.

THE GENERAL ANTERIOR ASPECT of the skull (see fig. 8, p. 382) of the Lory is very like that of *P. erithacus*, but the apex of the beak is more narrow and elongated, the nares looking more upwards and less outwards, the postorbital processes project less laterally, while the lachrymals are relatively broader, their processes more elongated, and the palatines also diverge slightly more ventrad. The mandible has its antero-dorsal margin more angular instead of rounded, resembling a very obtuse pointed arch inverted (see figs. 18 & 19, p. 393).

It differs also in not having lateral defects of ossification and in the less relatively vertical extent of the most postaxial part of each ramus.

THE GENERAL POSTERIOR ASPECT of the skull (see fig. 11, p. 385) presents us with a dorsal margin more flattened than in *P. erithacus*. Its surface is less concave medianly and less convex on either side of such concavity. The palatines diverge slightly more ventrad, and between them the bony beak shows a sudden narrowing between the lateral tooth or notch of either side, and ventrad of this it is narrower and more pointed. The quadrates jut out slightly less instead of decidedly more than the postorbital processes, and the middle of the occiput, just above the relatively somewhat wider foramen magnum, presents a rounded more marked convexity from side to side.

The apex of the mandible seems more prolonged, showing more of the ventral surface of the relatively more extensive symphysial portion.

Detailed Description.

I. THE BONY BEAK OR PROSOPIUM [1].

The prosopium, when VIEWED LATERALLY (see fig. 1), shows a dorsal margin which descends preaxiad in front of the nares, less sharply than in *P. erithacus*, though from just over the tooth on the ventral, or tomial, margin it arches even more rapidly; so that the apex of the prosopium descends rather more vertically, while it is proportionally narrower antero-posteriorly, where it begins to project ventrad of the line of the tomial margin, and is more pointed towards and at its apex. From a little in front of the preaxial margin of the nares back to the articulation of the prosopium with the cranium, the dorsum thus viewed is almost straight.

The nares are each longer antero-posteriorly and seem narrower dorso-ventrally because they look more upwards and less outwards than in *P. erithacus*. Their preaxial margin rises as a somewhat more marked ridge, while the surface of the prosopium in front of and below each nostril presents no depressed fossa.

In *P. erithacus*, on the other hand, there is (see fig. 2) just in front of and below each nostril a depressed area (*da*), the greatest breadth of which is more than two-thirds the diameter of the nostril, and is bounded below by a very marked groove which runs postaxiad to the postaxial border of the nostril, which border may be perforated by a series of small foramina, or these may be replaced by notches as in *L. flavopalliatus*.

[1] By this term I intend to denote the whole ossified mass in front of the cranio-facial articulation and the articulations of the zygomata and palatines. It includes the premaxilla, the maxillæ, maxillo-palatine processes, the nasals, and the ethmoidal and turbinal ossifications of the beak.

The lateral surface of the prosopium in front of a vertical line descending ventrad from the preaxial margin of each nostril is in *P. erithacus* slightly swollen and convex antero-posteriorly and rather more so dorso-ventrally. It is slightly more convex in both directions in *L. flavopalliatus*, in which also the more posterior portion of the side of the beak is less flattened than in *P. erithacus.*

The ventral margin of the prosopium is, as already implied, more sharply curved in front of the tooth. The tooth itself is thus slightly more prominent, and the tomial margin behind it is slightly more convex than in *P. erithacus.*

Postaxially the tomial margin ends in what may be called the jugal process (*jp*). It is broader and more rounded from within outwards, while above it the concavity which receives the preaxial end of the zygoma into it is much more marked in *L. flavopalliatus.* The jugal process itself extends relatively more postaxiad and somewhat more ventrad than in *P. erithacus*, so that the tomial margin presents a slight concavity towards its postaxial end, though very much less than that formed by the tooth and the parts in front of it. The upper boundary of this concave margin (which is the dorsal margin of the fossa for the zygoma) forms a suprajugalar (*sj*) process much like that of *P. erithacus*; but while in the latter species the postaxial margin of the beak above the suprajugalar process is postaxially concave and terminates dorsally in a small but distinct lachrymal process (*lp*)—which is received into the frontal beneath a slightly marked prominent nasal process (*np*) of the latter bone—in *L. flavopalliatus* the postaxial margin above the suprajugalar process is nearly straight, and ends in a very minute lachrymal process, which more absolutely coincides with the dorsal line of the cranium in this external view of the skull than in the other species.

In the latter, the lamina of bone which intervenes between the apex of the lachrymal process and the nearest point in the post-axial margin of the nostril is about as broad as two-thirds the antero-posterior extent of the nostril, but in *L. flavopalliatus* it is slightly less than half this extent.

The depth of the lamina of bone ventrad of the nostril to the tomial border is one-fourth less than twice the diameter of the nostril. In *P. erithacus* it is only one-fifth less.

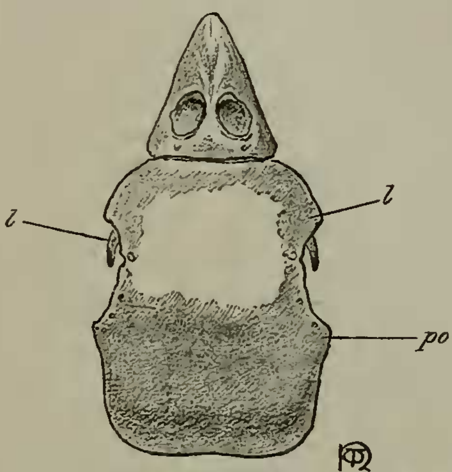
The dorsal aspect of the prosopium has the outline of an isosceles triangle, the apical angle whereof is of about 50° instead of 40°, as in *P. erithacus.* Its base (the preaxial boundary of the cranio-facial articulation) is straighter and does not so clearly exhibit the curves (a very slight median concavity with two slight convexities external to it, external to which, again, are two concavities each bounded externally by one of the lachrymal processes) which there exist in *P. erithacus.*

The lachrymal processes are relatively as well as absolutely smaller, and instead of projecting strongly outwards as well as backwards project backwards and but very slightly outwards.

The lateral margins of the triangle of the beak, thus viewed, are very slightly convex in both species.

But a great difference exists with respect to the nares. These are relatively larger, occupy a much larger portion of the dorsum of the prosopium, and are much more closely approximated than in *P. erithacus*. The distance from the cranio-facial articulation to a line joining the most preaxial parts of the margins of the nares is quite half the antero-posterior extent of the prosopium thus viewed, instead of less than half; while the internasal lamella, instead of about equalling the diameter of each nostril from within outwards, is less than a third of it.

Fig. 3.



Dorsal aspect of skull of *Lorius flavopalliatus*.

l. Lachrymal, constituting the preorbital prominence. | *po.* Postorbital process.

A large foramen exists in the middle of the dorsal lamella, separating each of the nares from the cranio-facial articulation, and just behind the outer part of the hinder margin of each nostril. These foramina I do not find in *P. erithacus*.

In the latter species, in the relatively broad lamella separating the two nares, there is a depressed area in the form of two grooves which run backwards—from a point in the middle of a line joining transversely the antero-posterior middle points of the dorsal margin of the nares—to the postaxial dorsal margin of the prosopium. From between these two lateral grooves, another groove runs forwards along the middle of the dorsum of the beak, nearly to an imaginary line which would connect the anterior margins of the two depressed areas in front of the two nares or further forwards. The groove then bifurcates, its two branches diverging at an angle of about 12°, and running forwards towards the ventral margin of the beak, but stopping short of it by a distance about equal to the diameter of each nostril, and each ending in a foramen which leads into the substance of the bone.

In *L. flavopalliatus* there is none of all this, save that a groove appears on the mid-dorsum at a point coinciding with the level of the antero-posterior middle of the nares, and then similarly bifurcates—its two branches running forwards and similarly terminating in foramina on each side of the beak at some distance from its apex.

THE VENTRAL ASPECT of the prosopium (see figs. 6 & 7, p. 378) presents a palatal surface slightly more concave both antero-posteriorly and transversely than in *P. erithacus*. In the latter species this surface is crossed by a very slightly marked ridge the median part of which is the most preaxial, the two lateral halves of the ridge thence diverging backwards at an angle of about 140°; this median point of divergence is rather nearer to the apex of the prosopium than to the hinder margin of its palatal surface. From immediately behind it, an antero-posteriorly directed groove runs postaxiad and leads to a small foramen, beneath which the margins of the groove medianly unite, and thence an antero-posterior prominence may continue on in the same direction as the groove and for about the same length, subsiding entirely before reaching the hinder margin of the palate.

In *L. flavopalliatus* there is no transverse ridge but only a slight smooth swelling of the palatal surface in about the position of the middle of that transverse ridge in *P. erithacus*. In front of this is a short median antero-posteriorly directed groove, while from behind it a similarly directed prominence runs backwards almost to the very postaxial margin of the palate. The middle of that margin in *P. erithacus* projects postaxiad rather more than the parts of the margin right and left of it, because the postaxial concavities for the palatines begin almost at once on either side of it.

In *L. flavopalliatus*, on the contrary, the middle part of the postaxial margin of the palate does not project postaxiad quite so far as does the part of that margin on either side which is mesiad to the concavity for the palatines. Nevertheless in that median part there is a minute process bounded laterally by a very minute notch, these notches together with the process they laterally bound appear in the middle of the postaxial median marginal concavity of the palate.

The free margin of that palate is relatively much more extensive in this species, the part of it interposed between the two surfaces for the palatines being fully equal to the extent of both those surfaces, while in *P. erithacus* it is but about equal to one of them. The postaxiad extensions of the prosopium on either side of the palatines are short, yet a little longer, relatively, than in *P. erithacus*. Thus the palatines do not advance so far forwards into the palatal region of the prosopium in the last-named species.

These lateral prolongations are strongly convex antero-posteriorly in both species, but more so in *P. erithacus*, since in *L. flavopalliatus* (as before said) the jugal process so projects as to produce a concavity towards the postaxial end of the tomial margin. Here also these lateral prolongations may be said to be slightly grooved antero-posteriorly, especially in the anterior portion of each. But in *P. erithacus* these cannot be said to be more than rather flattened.

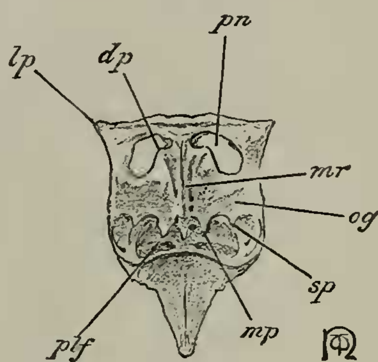
The ventral surface of the prosopium, behind the palate, shows, in both species, a median antero-posterior ridge with a wide concavity on either side of it, in the hinder part of which is a deepish fossa, beneath which the palatine passes forwards and external to which is the fossa for the zygoma. The median ridge projects backwards as a process from the postaxial margin of this postpalatal part of the ventral surface of the prosopium, which margin is otherwise slightly concave. The median ridge is less marked in *L. flavopalliatus* and the surface on either side of it is entire, while in *P. erithacus* it presents a bony network of diploë. This surface is much longer relatively in *L. flavopalliatus.*

The anterior aspect of the prosopium (see fig. 8, p. 382) is very similar in both species. Its outline approximates to that of an isosceles triangle with the base dorsad—the basal line being very slightly convex and the two lateral lines being convex towards the base and concave (more strongly so in *L. flavopalliatus*) towards the apex. In addition to the distinctive characters given in the description of the general anterior aspect of the skull, the following points may be mentioned:—The nares in *L. flavopalliatus* are more medianly approximated and nearer the uppermost margin of the prosopium than in *P. erithacus*, while the lamella of bone between each nostril and the tomial margin is relatively wider. In the latter the lachrymal process is more marked and projects more outwards. In *L. flavopalliatus* it hardly projects at all outwards, but only backwards. The most considerable difference is the greater extension ventrad of the apex of the prosopium (relatively as well as absolutely) in *P. erithacus.*

The posterior aspect of the prosopium (which cannot of course be well seen till this part is detached from the cranium) shows, in *P. erithacus*, an irregular surface which rises, at a moderately obtuse angle, from the hinder margin of the postpalatal ventral surface of the prosopium. The median ridge just described as existing on that surface is continued upwards (*mr*) in the middle of the posterior surface with a marked concavity on either side of the vertical grooves, which define, laterally, that ascending median ridge. Externally to this median portion of bone (with its ascending ridge and two lateral concavities) is on either side a large aperture, the two forming the *posterior prosopial nares* (*pn*). Each is an oval aperture, longer than broad and inclining outwards towards its ventral boundary. These nares and the whole prosopium are bounded dorsally by a transverse bar of bone (grooved posteriorly), the outer end of which projects outwards and slightly upwards, forming the *lachrymal process* (*lp*). The outer boundary of the posterior nasal opening is formed by a vertical bar of bone (one of the two external nasal crura) which descends from the lachrymal process and outer end of the dorsal horizontal bony bar, first narrowing downwards and then expanding beneath its lower end in the pit for the zygoma.

Above this is an oblique groove (*og*) running preaxiad and ventrad to below the lateral concave surface before noticed. From the inferior margin of the postaxial surface of the prosopium four processes depend. Two of these (*mp*) may be called median processes, and each is long and sharply pointed and projects

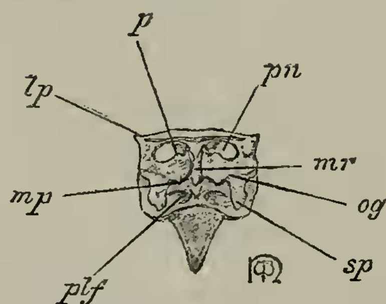
Fig. 4.



Posterior aspect of prosopium of *Psittacus erithacus.*

dp. Dorsal process.
lp. Lachrymal process.
mp. Median processes.
mr. Median ridge.
og. Oblique groove.
plf. Fossa for reception of palatine.
pn. Posterior prosopial nares.
sp. Lateral processes.

Fig. 5.



Posterior aspect of prosopium of *Lorius flavopalliatus.*

lp. Lachrymal process.
mp. Median processes.
mr. Median ridge.
og. Oblique groove.
p. Dorsal process.
plf. Fossa for reception of palatine.
pn. Posterior prosopial nares.
sp. Lateral processes.

ventrad on each side of the median ascending ridge. The other two, lateral or side processes (*sp*), are much shorter and depend one from each of the two oblique grooves (*og*) before described. The two inner margins of the two posterior prosopial nares are formed by the lateral margins of the median osseous piece which bears the ascending median ridge and the two concavities on either side of it. Towards the dorsal end of each lateral margin is a short but sharp dorsal process (*dp*), so that a notch is formed on either side of the uppermost part of the median ossification just before it merges into the horizontal osseous bar which forms the dorsum of the hinder aspect of the prosopium.

In *Lorius flavopalliatus* the posterior surface of the prosopium is relatively as well as actually much less dorso-ventrally extended; the posterior nares are more nearly horizontal and much less inclined ventrad externally; the lachrymal processes are shorter and especially less produced dorsad, and the lateral processes are larger (instead of smaller) than the median ones, and descend ventrad much beyond (instead of much less than) the median ones.

II. The Cranium.

The lateral aspect of the cranium (see figs. 1 & 2) shows—in addition to what has been said as to the lateral aspect of the skull as a whole—the following characters. At the dorsal part of its preaxial margin the nasal process of the frontal (*np*) is less conspicuous in *L. flavopalliatus* than in *P. erithacus.* Of the margin of the interorbital septum its dorsal part does not form so marked an angle with the ventral part of it in front of the attachment of the palatines. The preaxial end of the zygoma is less dorso-ventrally expanded. The preaxial margin of the palatine is slightly less, and its ventral margin rather more, concave. The postero-inferior angle is larger and more prominent, while instead of the more or less long postaxial process (*pp*), which in *P. erithacus* projects dorsad and postaxiad from the summit of the postaxial margin of the palatine, there is an exceedingly small one which does not project as much as does the ventral boundary of the postaxial concavity of the bone. The external surface of the palatine is also more concave dorso-ventrally, especially in its hinder half.

Of the dorsal margin of the palatine the part joining the *basis cranii* is about as long, relatively, as in *P. erithacus,* but the part of that margin postaxial to that junction develops two processes towards its postaxial termination.

The orbit is almost bounded infero-externally by bone, the lachrymal extending postaxiad to within a short distance of the sphenotic process (*sph*). Posteriorly, however, the orbit is less encircled by bone at its outer margin, for the postorbital process (*po*) is very much shorter, not projecting at all downwards, and relatively not so much outwards as in *P. erithacus.*

The sphenotic process is also relatively somewhat shorter and notably different in shape, and it does not descend, as in *P. erithacus*, almost to the dorsal margin of the zygoma.

In the latter species it projects forwards and downwards and also a little outwards. It is flattened dorsally and externally, and is longitudinally channelled on its ventral surface, the inner margin of that channel being prolonged into a short pointed process, while its outer margin continues on as the apex of the whole sphenotic process (fig. 7, *sph*, p. 378).

The external margin of that whole process, in *P. erithacus*, is even; no marked process projecting from it outwards and ventrad in front of the ascending process of the quadrate.

In *L. flavopalliatus* the sphenotic process curves a little inwards towards its apex, is flattened externally and dorsally, and ventrally grooved antero-posteriorly. Both the groove and the process from its internal margin are, however, relatively as well as absolutely shorter than in *P. erithacus*—especially the process. A marked difference between the two also exists at its outer border, which, in *L. flavopalliatus*, sends outwards and downwards a marked ecto-sphenotic process, so that the margin of the articular concavity for the quadrate (which appears, in both species, at the hinder end of the external border of the sphenotic process), instead of being slightly marked with no definite anterior boundary, as in *P. erithacus*, appears very marked and is sharply limited anteriorly by the ecto-sphenotic projection (see, in fig. 1, the small process projecting downwards just in front of the summit of the ascending process of the quadrate).

In *P. erithacus* a shallow temporal fossa runs postaxiad and slightly dorsad between the postorbital and sphenotic processes, being bounded preaxially by a marked ridge which descends on the cranial surface from the postorbital process to the inner side of the root of the sphenotic process. The temporal fossa has its dorsal margin defined by a slight ridge, very convex dorsad, which runs postaxiad from the postorbital process. The fossa is limited ventrally by another slightly marked ridge, nearly straight, or only most slightly convex dorsad, which continues on postaxiad the ventral margin of the sphenotic process. These two slightly marked ridges meet at a point as much behind the hinder margin of the auditory meatus as that meatus is broad, and at a little higher level than the uppermost margin of the meatus. At the point where these ridges meet there is a slight prominence which may be distinguished as the postsquamosal prominence (*psp*).

The auditory opening in *P. erithacus* is limited in front only by the ascending process of the quadrate. Its postaxial margin is formed by the anterior edge of the broad postmeatal bony lamella, which edge, or margin, is faintly concave preaxiad at its lower part, but most strongly concave preaxiad at its more dorsal portion.

The meatal opening is bounded above by a narrow bony lamina which extends preaxiad and mesiad (ventrally to the outer margin of the root of the sphenotic process) to bound posteriorly the cup into which the outer articular surface of the head of the ascending process of the quadrate fits. The inner anterior end of the lamina hardly descends at all behind the process of the quadrate, but a marked though short process projects outwards from its middle just above the middle of the auditory opening, which prominence may be distinguished as the suprameatal process (*sm*).

It juts outwards just beneath the ventral margin of the root of the sphenotic process.

The lamella of bone behind the meatus presents a rather wide, somewhat undulating surface, which is bounded dorsally and preaxially by the more postaxial part of the ridge bounding the temporal fossa below, while, more postaxially, it is bounded by a continuation of the same ridge running downwards and slightly backwards (concave forwards) to a junction with the lateral (and descending) part of the lambdoidal ridge, where a slight process or prominence—which may be distinguished as the exoccipital prominence (*ep*)—appears at their junction. From that point the postaxial margin of the postmeatal lamella presents an outline strongly concave backwards till it reaches the apex of the inferolateral part of the lamella, which apex projects outwards, backwards, and somewhat inwards as the *paroccipital process* (*par*).

In *L. flavopalliatus* the conditions are the same, save that the temporal fossa is somewhat smaller relatively as well as absolutely, and that a postsquamosal prominence at the junction of the very slight ridges bounding the fossa dorsally and ventrally is rudimentary. The auditory opening also is limited in front for almost its whole extent by a very delicate lamella of bone which descends behind and close to the ascending process of the quadrate (see fig. 1). The postaxial margin of the aperture is deeply concave for the upper two-thirds of its extent, while beneath this the margin is no longer concave but slightly convex.

The undulating lamella of bone behind the meatus is of a different shape from that of *P. erithacus*, being relatively broader (antero-posteriorly) dorsad and narrowing more rapidly ventrad. The very faintly marked exoccipital prominence is at a slightly higher level, and the postaxial margin of the lamella is nearly straight, extending forwards (preaxiad) as it proceeds downwards till it comes to the root of the paroccipital process (*par*), which is bent more sharply backwards than it is in the last-named species.

The outer surface of the postauditory lamella is somewhat less grooved and concave than in *P. erithacus*, but, as in that species, its ventral part is convex both dorso-ventrally and antero-posteriorly. Its anterior and posterior surfaces meet together as a sharper ridge than in the Grey Parrot.

The quadrate (*q*), as seen in this lateral view of the cranium, instead of having a nearly straight or only slightly convex margin (more than two-thirds the length of its ascending process), as in *P. erithacus*, has in *L. flavopalliatus* a dorsally, very convex margin not half the length of the ascending process. In both, however, it almost continues onwards postaxiad the dorsal margin of the zygoma, that bone articulating with the outstanding (zygomatic) process of the quadrate, which projects to about the same extent, relatively, in both species.

The postaxial margin of the quadrate is in both longer than the dorsal one; but while in *P. erithacus* it is somewhat rounded yet separable from the ventral margin by an obscurely-marked angle, in *L. flavopalliatus* both these margins run indistinguishably one into the other in one continuous curve.

In both species the ventral margin of the quadrate is convex in both directions, corresponding with the elongated articular groove of the mandible.

A second articular surface[1] for the mandible (one which articulates with the inner surface of the articular process of the latter) is situated on the hinder part of the external surface of the quadrate behind and below the externally extending zygomatic process. This surface is strongly concave from without inwards and slightly convex in the opposite direction. The anterior margin of the quadrate has a short, anteriorly concave outline where it joins the pterygoid (*pt*), dorsad of which is a very sharp-pointed process (the orbital process) extending forwards, inwards, and somewhat downwards from just below and in front of the base of the ascending process (see, in fig. 1, the process ascending above the hinder end of the zygoma, and, in fig. 2, above that of the pterygoid).

The zygoma, though nearly straight in both species, is slightly more bent concave dorsally for about its middle third in *L. flavopalliatus*. It is also, even relatively, somewhat more slender, and does not expand dorso-ventrally where it joins the prosopium nearly as much as in *P. erithacus*. Apart from this expansion the zygoma is throughout of nearly the same dorso-ventral and transverse extent in each species. As before said, the sphenotic process does not so nearly touch the zygoma in *L. flavopalliatus*; yet though it is thus relatively shorter, the lachrymal process approaches it much more nearly, diverging very slightly therefrom as it arches backwards, a little outwards, and subsequently upwards. The distance between its apex and that of the sphenotic process is not more than half the distance from the apex of the sphenotic process to the quadrato-zygomatic articulation, while in *P. erithacus* it nearly equals that distance.

The lachrymal narrows very gradually to its apex. This narrowing is more gradual in *L. flavopalliatus*, which also has the apex more truncated and the dorsal margin of the whole process more strongly concave upwards owing to its greater prolongation postaxiad.

The outer surface of the cranium in the lachrymal region in front of the orbit is smooth. The lachrymal is very convex dorso-ventrally down to a point nearly opposite the supra-jugular process of the prosopium. Then it becomes concave in that direction in both species, but the concavity is very marked in *L. flavopalliatus*, assuming the form of an antero-posteriorly directed groove, sharply limited above and below. In *P. erithacus* the same groove exists, but it is very much less marked. Beyond this groove the lachrymal is very slightly convex dorso-ventrally in *P. erithacus*, while in *L. flavopalliatus* it presents a more decidedly flattened surface which looks outwards and somewhat downwards.

The *postero-superior* margin of the palatine is, in both, connected with the *basis cranii* for rather less than half that margin's extent,

[1] See below, p. 391.

and at its preaxial end sends forwards a sharply projecting *anterior palatine* process (see p. 378, figs. 6 & 7, two processes behind the end of the line running inwards from the letters *sp*). Behind this attachment it descends backwards with a slightly irregular margin in *P. erithacus*, which runs on into that of a strongly-marked posterior palatine process (fig. 2, *pp*). In *L. flavopalliatus* this part of the postero-superior margin is still more irregular, presenting two blunt processes, one behind the other, and projecting dorsad and postaxiad almost at right angles to the general trend of the palatine. There is, however, only a very minute posterior palatine process (fig. 1, *pp*), which projects from behind the base of the more posterior of the two marginal processes just mentioned.

The *antero-superior* margin is, in both species, strongly concave, with a foramen (*for*) opening a little behind its middle portion.

The *antero-inferior* margin of the palatine is elongated, slightly concave, and somewhat thickened and rounded in *P. erithacus*. In *L. flavopalliatus* it is relatively, as well as absolutely, shorter, much more concave, and less thickened and rounded.

The *postero-inferior* margin of the bone is the shortest of all in both species, and is strongly concave postaxiad; but in *L. flavopalliatus* this concavity is mainly produced by the prominence of the rounded angle between antero-inferior and postero-inferior margins of the bone, while in *P. erithacus* it is chiefly owing to the great extension backwards of the long and pointed posterior palatine process, which, as before said, is but a minute process in *L. flavopalliatus*.

On the outer surface of the palatine two ridges run, in both species, postaxiad and ventrad, diverging backwards from the base of the anterior-palatine process, the inferior ridge (*p*) going to that of the posterior palatine process.

Ventrad of the lower of these two ridges, the surface in *L. flavopalliatus* is convex in both directions for most of its anterior half, and concave (especially dorso-ventrally so) for slightly more than its posterior half (fig. 1, *p*). In *P. erithacus* this convexity is hardly to be traced, while the concavity just described is less marked.

The most dorsal portion of each palatine is inflected mesiad, and so is much hidden when the cranium is viewed laterally, and can be best perceived when the ventral and inner surface is looked at (figs. 6 & 7). The higher of the above-mentioned two diverging ridges coincides with the line of inflection. The inner surface of the palatine will be noticed when the cranium as seen on its ventral aspect is described.

The divergences, as regards the angles formed by the margins of the palatine with each other, are given after the list of cranial dimensions.

In both species the pterygoid (*pt*), thus laterally viewed, is a slender bar of bone of equal breadth save that it expands slightly at its articulation with the quadrate. It appears below the zygoma in *P. erithacus*, diverging from it very slightly ventrad and postaxiad. In *L. flavopalliatus* it appears, for the most part, above the zygoma.

The side wall of the skull seen laterally within the circle of the parts hitherto described presents the following characters:—

The anterior portion of the inferior margin (preaxiad of the junction with the palatines) does not ascend preaxiad so sharply in *L. flavopalliatus* as in *P. erithacus*, the angle formed by it with the inferior margin of the *basis cranii* being about 155° instead of 140°. The inferior margin behind the junction with the palatines is rather more concave, and its general trend is nearly in a straight line with the line of the palatine attachment, whereas in *P. erithacus* these two lines form an angle of about 160°.

In both species a prominence—the *septal process*—is developed at the anterior end of the antero-inferior margin of the cranium (figs. 6, 7, 9, & 10, *sp*), but it is sharper and more prominent in *L. flavopalliatus* than in *P. erithacus*. In both species the side wall of the skull seen within the orbit consists of an antero-inferior septal part (presenting an almost vertical, slightly undulating surface, bounded above and behind by the olfactory and optic foramina) and a postero-superior surface. The latter inclines outwards and upwards till it reaches the superior margin of the orbit, and presents a smooth surface strongly concave antero-posteriorly and slightly so transversely. It is bounded inferiorly by a transverse ridge (figs. 9 & 10, *tr*, pp. 383, 384), which runs from a point just external to the small foramina beside the optic foramen, outwards to the postorbital process. This ridge is much more marked and distinct in *L. flavopalliatus* than in *P. erithacus*.

Near the postero-inferior angle of the septal part is a slightly-marked concavity, which runs forwards from a small rather deep fossa, which is bounded externally by a small process—lateral eustachian process (figs. 6 & 7, *le*)—which extends forwards to a very slight degree further than the median eustachian process (*me*), which projects preaxiad beneath the eustachian aperture. This fossa is more marked in *L. flavopalliatus* than in *P. erithacus*, but the lateral eustachian process is less sharply prominent.

Above this concavity, between it and the optic foramen, is a marked convexity which extends forwards to a little in front of the latter. This convexity is relatively, as well as absolutely, narrower in *L. flavopalliatus*, and is indeed reduced to a mere rounded ridge passing forwards and slightly upwards to just in front of and beneath the optic foramen. In the superior portion of the septal part there is a concavity just below the large olfactory opening, which is much more marked in *P. erithacus*. In both species, in front of the large aperture just named, a prominent ridge—the *crucial ridge*—runs outwards and forwards from about the middle of the front boundary of the olfactory aperture and bounds the preorbital foramen below, ending at the inferior margin of the lachrymal (figs. 9 & 10, *cr*), and bounds postaxially the concavity last mentioned. The large olfactory aperture at the antero-dorsal part of the septum is subreniform and about twice as long as broad in *P. erithacus*. In *L. flavopalliatus* it is more rounded.

The dorsal aspect of the cranium (see fig. 3, p. 367) shows, in both species, a surface which is convex both antero-posteriorly and transversely. It is, however, much flattened between the orbits. In *L. flavopalliatus* there is a slight though marked depression in the hinder part of the interorbital region, which is hardly to be detected in *P. erithacus*, while in the latter species there may be a median longitudinal depression in the parietal region which does not exist in *L. flavopalliatus*. In both the dorsal surface of the cranium may be said to be bounded by ten margins.

The first or preaxial margin is that which adjoins the prosopium, and is on the whole very slightly concave.

The second and third margins (the two preorbital margins) each proceed outwards and postaxiad from one outer end of the first (prosopiad) margin to the preorbital prominence of the same side, and each is about half as long as is the lateral margins of the prosopium. The two preorbital margins diverge postaxiad at an angle of about 95° in *L. flavopalliatus* and of about 80° in *P. erithacus*.

The fourth and fifth margins form the anterior part of each orbital margin (each anterior orbital margin), while the sixth and seventh margins of the dorsum of the cranium constitute the posterior part of each orbital margin (each posterior orbital margin). The anterior and posterior orbital margins meet at a marked angle of about 120°, the apex of which is a little in front of the middle of each orbit's margin. In *P. erithacus* they run into each other in a curve with only a faint indication of an angle of about 140°, and this is at approximately the middle of each total orbital margin.

An axial groove, rather wide and shallow, runs along each side of the dorsum of the cranium within the orbital margin, the two grooves being separated by the moderate transverse convexity of the interorbital region. There is a series of foramina in each groove, which is more marked in *P. erithacus* than in *L. flavopalliatus*.

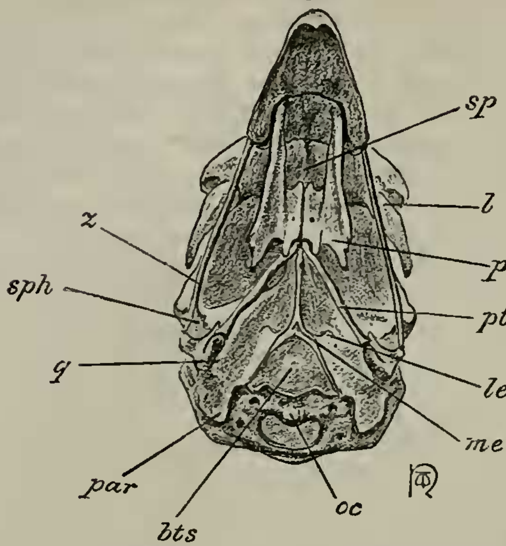
The eighth and ninth margins of the cranial dorsum (the two temporal margins) extend from the postorbital prominence to the outer end of the lambdoidal ridge of either side. Each presents a sigmoid curvature, concave behind the postorbital prominence and then convex in the squamosal region, external to which the suprameatal process, the posterior end of the zygomatic process of the quadrate, and the hinder end of the zygoma may appear.

The tenth, or occipital, margin presents in both species a gentle convex curvature with a small median concavity.

The ventral aspect of the cranium exhibits, in both species, a roughly quadrilateral outline, the smallest margin of which is preaxial and corresponds with the postaxial margin of the prosopium. The lateral sides are the longest and coincide with the zygomata (*z*) and quadrates (*q*), while the hinder margin is convex and formed by the occiput. The palatines (*p*) extend forwards much beyond its anterior margin, and each preorbital prominence projects outwards beyond the preaxial third of the zygoma.

In the middle of the anterior part of the *basis cranii* is a rather elongate space, bounded in front by the postaxial margin of the

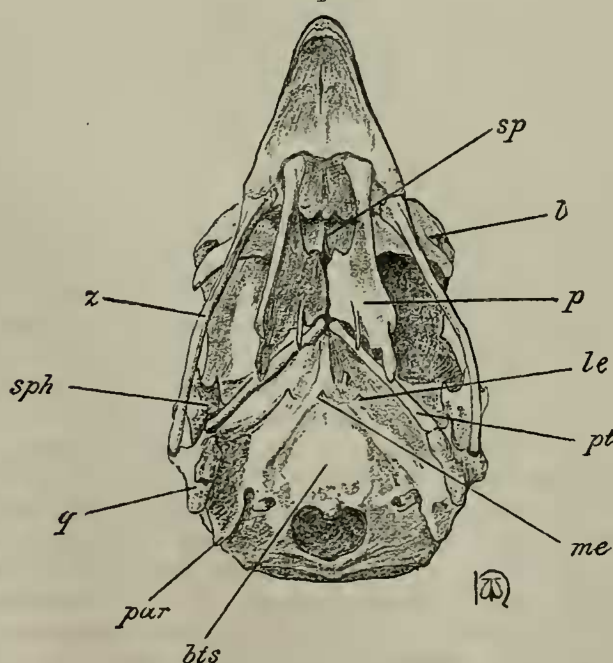
Fig. 6.



Ventral aspect of skull of *Lorius flavopalliatus.*

bts. Basi-temporal shield.
l. Lachrymal.
le. Lateral eustachian process.
me. Median eustachian process.
oc. Occipital condyle.
p. Palatine.
par. Paroccipital process.
pt. Pterygoid.
q. Quadrate.
sp. Septal process.
sph. Sphenotic process.
z. Zygoma.

Fig. 7.



Ventral aspect of skull of *Psittacus erithacus.*

(Lettering the same as in fig. 6.)

prosopium and laterally, and also postaxially, by the palatines. The anterior and larger portion of the roof of this space is formed by the postpalatal ventral surface of the prosopium ; behind the hinder margin of this surface it is roofed by the *basis cranii*.

This part of the ventral surface of the cranium shows in *L. flavopalliatus* a median, triangular raised surface narrowing backwards and traversed antero-posteriorly by a slightly marked ridge. Externally this surface is a groove widening backwards, with a perforation at its hinder end for the olfactory nerve. Postaxially each of these fossæ is limited by a transverse ridge—the crucial ridge (figs. 9 & 10, *cr*). Beneath the anterior part of the fossa a sharp uncinate process projects inwards, and, at its apex, somewhat backwards.

In *L. flavopalliatus* the dorsal portion of each palatine is bent mesiad to meet the corresponding part of the other palatine much more sharply than in *P. erithacus*, so that when the *basis cranii* is looked at these bent-in portions of the two palatines present a considerable extent of flattened surface almost equalling that of the hinder margin of the bony palate between the two palatines. Moreover, each bent-in part forms internally almost a right angle with the vertical main portion of the bone, while externally (or dorsally) the angle is yet more marked. In *P. erithacus* each palatine gently curves to meet its fellow, so that there is hardly any ventral flattened surface, while internally the median part forms a very obtuse angle with the vertical main portion of the bone, though externally (or dorsally) the angle is very marked and the dorsal surface is flattened and transversely concave. Thus the inner and outer surfaces of the palatine correspond in neither species.

From the inner end of the anterior margin of each palatine an anterior palatine process[1] extends forwards beside its fellow of the other palatine. These are less marked in *P. erithacus*, and they are not side by side but diverge more forwards, so leaving a greater gap between them. On the other hand, this species has (as before mentioned) long posterior palatine processes which are wanting in *L. flavopalliatus*. In the latter there are two postaxial processes, one on side of the posterior end of the mid-junction of the palatines, so that the postaxial margin of the two conjoined palatines presents three concavities instead of only one as in *P. erithacus*, though a delicate styliform process extends backwards from the ventral and inner surface of each palatine to beyond its postaxial margin.

In both species the pterygoids (*pt*) diverge from the middle of the hinder margin of the palatines and the rostrum of the *basis cranii*, with which latter, however, they do not articulate.

The palatine, the pterygoid, and the zygoma of each side bound a triangular space wherein is seen the roof of the orbit. The great olfactory opening is hidden (in this view) by the palatines. In the front of each of these triangular spaces is seen the junction of the prosopium with the cranium and the part behind it (just described), only the crucial ridge is almost entirely concealed by

[1] See above, p. 375, the first three lines.

the palatines. Into the posterior angle of this triangular space the sphenotic process (*sph*) is seen to project in *P. erithacus* but hardly in *L. flavopalliatus*.

The zygoma arches outwards most at a little behind its antero-posterior middle in both species.

The preorbital prominence also projects outwards beyond the anterior half of the zygoma, and between the latter and the outer margin of that process the lachrymal is seen extending backwards and slightly outwards to about the hinder end of the anterior three-fourths of the zygoma in *L. flavopalliatus*, and to about the hinder end of its first third in *P. erithacus*.

The quadrate (*q*) in the last-named species presents, thus viewed, a roughly triangular surface, with one margin mesiad (postaxiad from the attachment of the pterygoid), another externad and postaxiad, and the third (between the attachments of the zygoma and pterygoid) preaxiad and externad. The last is strongly concave, the second very slightly so, while the first is nearly straight and forms the inner margin of the elongated convex articular surface for the long articular concavity of the mandible.

The quadrate of *L. flavopalliatus* only differs in that the second margin is relatively as well as absolutely shorter, the quadrate (as before mentioned) extending so much less backwards behind its attachment to the zygoma. The angle formed by the first and second margins is also much more obtuse than in *P. erithacus*.

The hindmost boundary of the ventral aspect of the cranium is, in both species, formed by the lambdoidal ridge. In front of this is the occipital region, bounded anteriorly by the occipital condyle and two lines proceeding thence to the two paroccipital processes. Medianly there is visible a median prominence (which is one running dorsad from the middle of the dorsal margin of the foramen magnum) and a depression on either side of it. The prominence is rather more marked in *L. flavopalliatus* than in *P. erithacus*.

The deep cleft between the quadrate and the end of the paroccipital process is absolutely as well as relatively greater in *L. flavopalliatus* than in *P. erithacus*, while the quadrate does not extend backwards so far, and is relatively much more distant from the hinder end of the paroccipital process.

Just in front of the condyle is a small fossa which is very much more marked in *L. flavopalliatus*. In front of this again, in the same species, is a transverse zigzag ridge which bounds postaxially the basi-temporal shield (*bts*). This ridge has the shape of the letter **M** with extremely wide angles, the median angle being postaxiad and forming the antero-inferior boundary of the small precondyloid fossa just mentioned. Each lateral end of the ridge bounds the jugular foramen anteriorly—the vagal foramen opening just above it—and joins a ridge bounding laterally (on the same side) the basi-temporal shield (*bts*).

In *P. erithacus* this transverse ridge is very indistinct and not **M**-like, and presents four small postaxiad prominences on about the same transverse line, while the two external ones probably answer to the lateral ends of the M-like ridge of *L. flavopalliatus* because a vagal foramen opens just above each of them.

In this species there is on either side of the cranium a roughly quadrilateral space bounded anteriorly by the outer end of the posterior transverse basi-temporal ridge, internally by the lateral margin of the foramen magnum, externally by the paroccipital process, and posteriorly by a rounded prominence (exoccipital prominence) running from the summit of the side margin of the foramen magnum to the posterior surface of the paroccipital process. In *P. erithacus* the conditions are similar save that the exoccipital prominence is somewhat less prouounced and ridge-like. In both species a foramen opens on the exoccipital prominence about midway between the margin of the foramen magnum and the base of this paroccipital prominence, but this foramen is larger and very much more couspicuous in *L. flavopalliatus*.

The side of the paroccipital process bounding this quadrilateral space (the inner aspect of the process) has in both species a conspicuous foramen opening into it.

The infero-external aspect of this process is very different in the two species. In *L. flavopalliatus* it is wide, strongly concave transversely, and looks mainly downwards. In *P. erithacus* it is but slightly concave transversely and looks more outwards.

The posterior end of the paroccipital process in *L. flavopalliatus* is bent more sharply backwards than in *P. erithacus* and also somewhat inwards (see figs. 1 & 2 and 9 & 10).

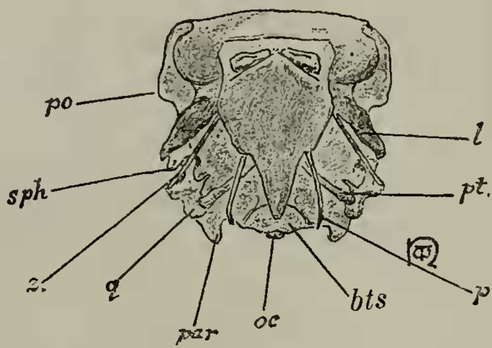
The basi-temporal shield is limited laterally by two very sharply raised ridges, which meet together just below the eustachian aperture and end in a median sharp-pointed process projecting forwards beyond and beneath it (fig. 6, *me*). Between its lateral and postaxial ridges the shield is smooth and slightly concave, without ridges or foramina.

In *P. erithacus* its lateral ridges are much less well-defined and are represented by two slightly elevated prominences each of which is marked by a very narrow longitudinal groove, but the shield also ends medianly in front in a pointed eustachiau process (*me*) projecting forwards beneath the eustachian opening. The surface of the shield is slightly undulating, and a little behind the eustachian process is a depression behind which there may be a median ridge.

In *L. flavopalliatus* there is outside each lateral basi-temporal ridge a wide transverse concave surface which becomes continuous posteriorly with the ventral surface of the paroccipital process. It is bounded superiorly and externally by a slight ridge running forwards and inwards from just below the foramen ovale and ending in a small preaxiad process—the lateral eustachian process (fig. 6, *le*). In *P. erithacus* this concave surface is narrower and does not approach so nearly the foramen ovale, while the ridge bounding it superiorly and externally ends in a more marked lateral eustachian process (fig. 7, *le*).

In front of the eustachian foramen and just above it begins the rostrum of the *basis cranii*, which gets sharper as it advances forwards to its junction with the palatines. On each side of its hinder part is a marked fossa which runs backwards to beneath the lateral eustachian process, while three small foramina open into it. In *P. erithacus* these two fossæ are much less marked.

Fig. 8.



Preaxial aspect of skull of *Lorius flavopalliatus*.

l. Lachrymal.	*po.* Postorbital process.
bts. Basi-temporal shield.	*pt.* Pterygoid.
oc. Occipital condyle.	*q.* Quadrate.
p. Palatine.	*sph.* Sphenotic process.
par. Paroccipital process.	*z.* Zygoma.

The anterior aspect of the cranium is mainly hidden by the prosopium. The frontal region is visible above it, the lachrymal beside it, more externally the lower part of the hinder wall of the orbit and the postorbital process (*po*).

Beneath the prosopium the palatines descend and diverge for a space about equal to that which exists between the spot where either one of them begins to be hidden by the prosopium and the nearest point of the margin of the nares.

External to the palatines, the pterygoids are seen diverging, at a much more open angle, to the quadrate, while from the external process of each quadrate the zygoma is seen ascending to the side of the prosopium.

Medianly and inferiorly the basi-temporal shield is visible between the diverging palatines.

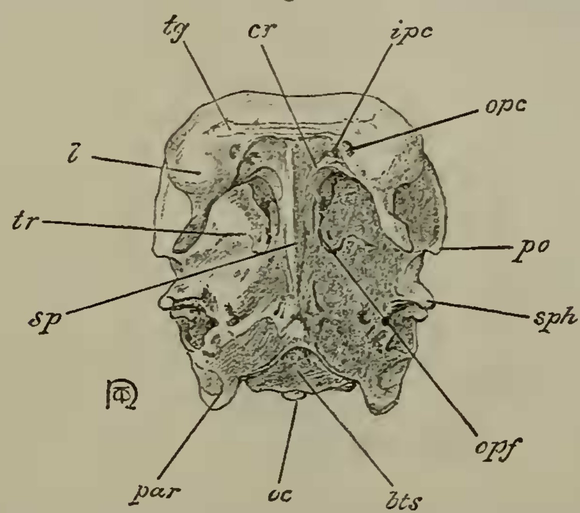
In *P. erithacus* the frontal region seems to rise above the prosopium for a space about equal to that between the posterior margin of the prosopium (thus seen) and the anterior margin of the bony nostrils, while the breadth of each of the latter is about equalled by that of the broadest part of the lachrymal. The palatines diverge at an angle of about 25°, and the pterygoids at one of about 97°. The paroccipital processes are visible just within each quadrate.

In *L. flavopalliatus* the frontal is rather less visible, but the lachrymal is broader, especially at the dorsal margin of the external lachrymal groove. Its greater length causes it also to be more visible alongside of the zygoma.

The paroccipital processes are much more visible than in *P. erithacus*, and descend, very decidedly, below the quadrates. The palatine and pterygoid angles are much as in *P. erithacus*.

When the quadrate is removed we find, in both species, that the glenoid fossa of the squamosal is visible at the root of the ventral surface of the sphenotic process. Within this is a narrow rough surface which separates the glenoid fossa from the smaller, more internal, fossa of the pro-otic, which serves for the articulation of the inner tubercle of the quadrate.

Fig. 9.



Anterior aspect (prosopium being removed) of *Psittacus erithacus*.

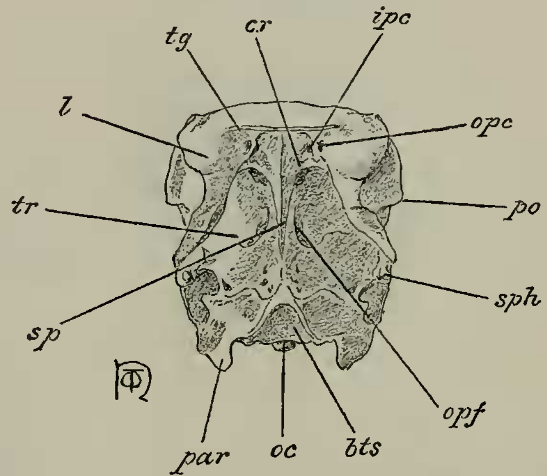
bts. Basi-temporal shield.
cr. Crucial ridge.
ipc. Inner precranial foramen.
l. Lachrymal, forming the preorbital prominence.
oc. Occipital condyle.
opc. Outer precranial foramen.
opf. Optic foramen.
par. Paroccipital process.
po. Postorbital process.
sp. Septal process.
sph. Sphenotic process.
tg. Transverse groove.
tr. Transverse ridge.

On the removal of the prosopium, the anterior aspect of the cranium shows medianly, in *P. erithacus* (fig. 9), the prominence of the base of the cranial septum, with the slightly marked septal process (*sp*). On either side of this median keel are the large olfactory apertures.

Dorsad is the surface of the frontal and beneath it the transverse groove (*tg*) for the dorsum of the prosopium, the fossæ at the outer ends of which receive its lachrymal processes. Beneath these two fossæ is the swollen preaxial surface of the lachrymal (*l*) with its depending process transversely grooved externally. Within the lachrymal on each side, and just mesiad of the fossa for the lachrymal process, is a foramen—the *outer precranial foramen* (*opc*)—separated by a ridge from the fossa before described[1] as bounded postaxially by the crucial ridge, and beneath it the crucial ridge (*cr*) is plainly to be seen passing outwards from the cranial septum to the adjacent surface of the lachrymal. At the bottom of this fossa is (*ipc*) the *inner precranial foramen.*

External to the distal end of the lachrymal on either side is the postorbital process (*po*), beneath which is the notch interposed between it and the sphenotic process (*sph*). Passing inwards from the postorbital process to the vicinity of the optic foramen (*opf*), the transverse ridge before noticed[1] (*tr*) is to be seen. Finally between the paroccipital processes is the basi-temporal shield (*bts*), beneath the middle of which is the prominence of the occipital condyles (*oc*).

Fig. 10.



Anterior aspect (prosopium being removed) of *Lorius flavopalliatus.*

(Lettering the same as in fig. 9.)

In *Lorius flavopalliatus,* thus seen, the transverse groove is shorter, the lachrymal is notably longer, and the paroccipital processes are narrower, less blunt and rounded distally, and more inclined mesiad; the basi-temporal shield is also relatively as well as actually narrower from side to side.

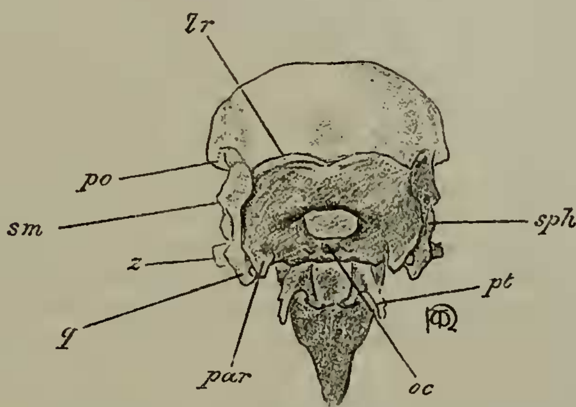
THE POSTERIOR ASPECT of the cranium presents, in *P. erithacus,* a dorsal margin which is very convex on either side but slightly concave in its middle. Laterally its outline is mainly straight and vertical with certain projections: these are, above, the postorbital margin ending in the postorbital process, beneath which is a small sharply marked concavity limited below by the projection of the suprameatal process. Just below this, again, is another concavity (as sharp as, though shorter than, the preceding one) which

[1] See above, p. 376.

coincides with the uppermost (and most concave) part of the post-axial margin of the external auditory meatus. Below this, again, is the nearly straight lower part of this margin, which inclines slightly inwards as it descends, and is bounded inferiorly by the sudden out-jutting of the zygomatic process of the quadrate for the zygoma together with the posterior end of the latter. Below this is the lateral outline of the quadrate, which is nearly straight and vertical to the rounded inferior end of that bone.

In *L. flavopalliatus* the median concavity of the dorsal margin is less marked; the lateral margin is generally similar to that of the other species save for the much less, relative as well as absolute, extent of the part formed by the quadrate below its zygomatic process, and that the sphenotic process (*sph*) is seen projecting outwards beyond the posterior margin of the external auditory meatus. The suprameatal process (*sm*) projects sharply outwards.

Fig. 11.



Postaxial aspect of skull of *Lorius flavopalliatus*.

lr. Lambdoidal ridge.
oc. Occipital foramen.
par. Paroccipital process.
po. Postorbital process.
pt. Palatine.
q. Quadrate.
sm. Suprameatal process.
sph. Sphenoidal process.
z. Zygoma.

The inferior margin of the cranium, thus seen, is, in *P. erithacus*, formed externally by the two zygomatic processes of the quadrate. Next within comes the inferior border of each quadrate, and then that surrounding the deep and sudden notch which divides each quadrate from the paroccipital process, which does not descend as much as does the quadrate. The median part of the inferior margin (apart from the palatines) presents a low arch medianly interrupted by the projection downwards of its keystone—the basi-occipital with its condyle.

This margin in *L. flavopalliatus* is similar save that the paroccipital processes descend almost as much as do the quadrates.

On this view the palatines are seen descending and diverging at an angle of about 23° in *P. erithacus*, and at a slightly more open angle in *L. flavopalliatus*.

In *P. erithacus* the lambdoidal ridge traverses the posterior surface of the skull a little below its dorso-ventral middle. Above this the occiput is rounded.

This lambdoidal ridge is met (as before noted) by the posterior continuation of the ridge which bounds the temporal fossa inferiorly, and at the point of junction develops an obscurely marked prominence we have called the squamosal prominence (see fig. 2, *psp*). Thence a slightly marked ridge descends vertically to another small prominence or exoccipital process. From this latter another very slightly marked ridge—the occipital ridge—passes inwards and upwards till it nearly joins the lambdoidal ridge, and thus a triangular surface becomes defined. Then this slight occipital ridge continues on inwards and downwards till it meets a prominence running upwards from the middle of the dorsal margin of the foramen magnum to the lambdoidal ridge, or may descend to the margin of that foramen, and thus a second triangular surface becomes defined. Beneath the occipital ridge there is, on each side of the median occipital protuberance, a rather extensive but shallow concavity.

In *L. flavopalliatus* the lambdoidal and occipital ridges are both about equally, and only very slightly, prominent and so close together that only a faint and narrow groove runs between them. The squamosal prominence is very slight, and the exoccipital process hardly to be detected. The median rounded occipital prominence is much more marked, and so is the concavity on either side of it, but the degree of concavity is more uniform over this concave space than in *P. erithacus* and is most marked just below the occipital ridge.

In *P. erithacus* each paroccipital process is somewhat pyramidal, but may be said to present two surfaces limited by a ridge which extends backwards from the hind end of the ridge bounding laterally the basi-temporal shield to the apex of the process, and thence upwards and slightly outwards, finally curving inwards to the exoccipital process.

The outer surface of the paroccipital process is slightly convex transversely and very slightly concave in the opposite direction. The inner surface is very strongly convex transversely and medianly concave dorso-ventrally. The process is bent much backwards (but hardly inwards) towards its apex.

In *L. flavopalliatus* it presents more exclusively two surfaces, the ridge which divides them from each other being sharper. It is so bent that what corresponds to the outer surface of the process in the other species here looks mainly downwards. It is also concave both transversely and antero-posteriorly. The opposite surface looks mainly upwards and is strongly convex transversely at the root of the process, but concave in the opposite direction, especially towards its apex.

The process is bent rather more inwards than in *P. erithacus*, and very much more strongly and sharply backwards.

The *quadrate* in *P. erithacus* has its columnar process long and stout. At its apex is a large external and smaller internal articular surface separated by a narrow groove.

Its orbital process is short, delicate, and pointed (see fig. 2, p. 364), arching forwards and inwards just above the pterygoid. A short but deep concavity separates it from the anterior end of the inferior surface of the quadrate, which there projects forwards, developing a small rounded condyle (separated slightly from the anterior end of the long articular surface, or elongated condyle for the mandible) which fits into cup of hinder end of pterygoid.

The zygomatic process presents ventrad an outer articular surface in the form of an antero-posterior convexity and a slight transverse concavity to articulate with the mandible dorso-laterally. This is the part of the quadrate which articulates with the upper articular surface of the mandible, while the elongated ventral condyle of the quadrate articulates with the long concave inferior articular surface of the mandible. The inferior articular surface of the quadrate is elongated and nearly straight (slightly concave mesiad), extending forwards and inwards on a line with the pterygoid which is in front of it. Above it is the little condyle for the cup of the pterygoid above-mentioned. In both species the elongated condyle for the mandible is larger at its anterior end, but more predominantly so in *P. erithacus*. Just above its anterior end is the articular convex surface for the pterygoid, while in front of the apex of the zygomatic process is a small cup to receive within it the end of the zygoma.

The extent of the body of the quadrate behind the zygomatic process is longer than that in front of it to the front margin of the base of the ascending orbital process, and the depth from the zygomatic process about equals the length thence to the apex of the orbital process. In both species the hinder margin of the quadrate is continuous and does not develop any strongly projecting process.

In *L. flavopalliatus* the ascending columnar process is relatively longer and more slender. The extent of the quadrate behind the zygomatic process is also shorter than that in front of it to the front margin of the base of the orbital process, and its depth from the apex of the zygomatic process is shorter than from that point to the apex of the orbital process,—the inferior and still more the hinder portion of the quadrate being, relatively as well as absolutely, much smaller than in *P. erithacus*.

III. The Mandible.

The symphysial portion of the dentary part of the mandible externally, is nearly straight antero-posteriorly (*i. e.* dorso-ventrally) in *L. flavopalliatus* but gently convex in *P. erithacus*. In both it is decidedly convex transversely, but it presents a broadened-out gentle convexity in the latter species, while in the former (fig. 14, p. 390) it is narrower and sharper and therefore more convex. In both the symphysial convexity passes smoothly into the relative flatness of the adjacent external surfaces of the beak-bearing parts of the lateral rami, without any dorso-ventral ridges dividing it from the latter. The front, or external, surface of the symphysis is beautifully marked with vascular grooves in *P. erithacus* and less so in *L. flavopalliatus*. The apex of this surface is dentated or somewhat irregularly serrated in both, but the transverse extent of this serrated margin is less relatively as well as absolutely in *L. flavopalliatus*. In *P. erithacus* there is a depressed transverse area (·7 mm. long × ·12 broad) just below the serrated margin and a number of small foramina open into this area (see fig. 19, p. 393). In *L. flavopalliatus* there is no such depressed area, though there are small foramina close to the dorsal margin of the mandible.

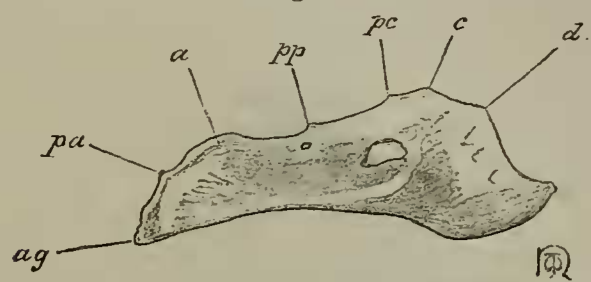
At a short distance from the dorsal margin, two small foramina open on either side of the symphysis, the two pairs being about as distant from each other as from the dorsal margin of the mandible. They are relatively much nearer the dorsal than the postero-ventral margin of the mandible in *L. flavopalliatus*, because in that species the symphysis is so much longer compared with the total antero-posterior extent of the mandible. From each pair of foramina a groove runs backwards and inwards till it meets its fellow of the opposite side, from which point a single groove runs downwards and backwards to the middle of the postero-inferior symphysial margin. Thus a Y-shaped groove is formed. The two upper arms of the Y meet at a much more open angle in *P. erithacus* than in *L. flavopalliatus*. Their point of junction also in the former species is at about the dorso-ventral middle of the symphysis, while in the latter it is distant from the postero-inferior margin only one-third of the total dorso-ventral extent of the symphysis.

When the mandible is viewed laterally, its supero-anterior margin presents, in *P. erithacus*, a strongly marked concavity bounded in front by the apex of the mandible and postaxially by an obscurely marked process I have called the dentary process (*d*). The process is still less marked in *L. flavopalliatus*, while the concavity between it and the mandibular apex is but slight and so presents a great contrast to that part in the other species. In both, a faintly marked more or less undulating ridge proceeds downwards and backwards from the dentary process to the ventral margin of the ramus, and this marks the limit of the postaxiad extension of the bony beak.

The posterior margin of the symphysial portion of the mandible is very different in the two species. In *P. erithacus* (fig. 17) it is in the form of a pointed arch, neither acute nor obtuse, but in *L. flavopalliatus* it is a very open elliptical arch and less strongly concave (see figs. 16 & 14). Its middle point is relatively very much nearer one between the anterior ends of the inferior articular surfaces, because the symphysis is relatively so much longer in this species.

The postero-superior surface of the symphysis is strongly concave transversely, but only very slightly so antero-posteriorly in both species, indeed in *L. flavopalliatus* it would be almost perfectly straight but for the fossa for the geniohyoid and the transverse prominence in front of it. A faintly marked curved line (convex postaxiad in *P. erithacus* with a sigmoid flexure, concave postaxiad above and convex postaxiad below in the other species) descends—from the dentary process in *P. erithacus*, from behind the dentary process in *L. flavopalliatus*—to the dorsal margin of the fossa for the genioglossus (*gg*). This fossa is much more marked in *L. flavopalliatus*, and, on account of the length of the symphysis, relatively nearer the postaxial margin of the bone. In *P. erithacus* it is twice

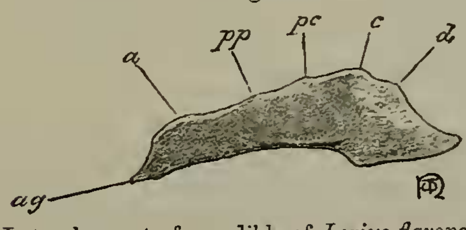
Fig. 12.



Lateral aspect of mandible of *Psittacus erithacus*.

a. Articular prominence.
ag. Angular process.
c. Coronoid process.
d. Dentary process.
pa. Postarticular process.
pc. Postcoronoid process.
pp. Prearticular process.

Fig. 13.



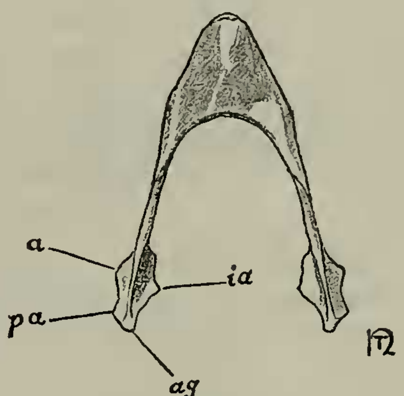
Lateral aspect of mandible of *Lorius flavopalliatus*.

(Lettering the same as in fig. 12.)

or more as distant from its anterior margin as from the posterior one, and it is bounded supero-anteriorly by an arched ridge, concave backwards, just beneath which are one or two vascular foramina. The fossa is wider and more shallow than in *L. flavopalliatus*, and bounded infero-posteriorly by a bony ridge which constitutes the postero-inferior margin of the symphysis (see figs. 16 & 17). In *L. flavopalliatus* it is bounded supero-anteriorly by a very delicate lamina of bone, in front of which is a rather wide transverse prominence convex antero-posteriorly. Behind the fossa there is a smooth portion of bone intervening between it and the postaxial margin of the symphysis.

The ramus is deepest at the coronoid process (*c*) in both species, thence it gradually narrows postaxiad in *P. erithacus*, but more gradually still in *L. flavopalliatus*, the dorsal and ventral margins of the ramus inclining towards each other at an angle of about 16°, while in *P. erithacus* the angle is about 15°. The dorsal margin behind the dentary process is nearly straight and somewhat inflected in the last-named species, but decidedly though slightly concave in *L. flavopalliatus* and not inflected, and the outer surface of the ramus is scarcely convex from above downwards, but is rather strongly so in *P. erithacus* (a little below the dorsal margin at this part), and, to a less degree, from before backwards.

Fig. 14.



Ventral aspect of mandible of *Lorius flavopalliatus*.

a. Articular prominence.
ag. Angular process.
ia. Internal articular process.
pa. Rudiment of a postarticular process.

The margin between the dentary and coronoid processes is relatively much shorter in *L. flavopalliatus* and (when the mandibles rest on a horizontal surface) is more upwardly inclined postaxiad. In both there is a small postcoronoid process (*pc*)—it may be almost obsolete in *P. erithacus*,—but the margin between it and the coronoid is relatively longer and less concave in *L. flavopalliatus*. The margin extending thence to the slightly marked prearticular process (*pp*) is almost straight in both, but slightly more concave as well as longer in *P. erithacus*. Between the prearticular process and the articular prominence (*a*) the margin is slightly concave in both; very slightly more so in *P. erithacus*. The articular prominence is about equally developed in both species, but while in the last-named species there is a distinct though very small postarticular process (*pa*), whence the postaxial margin of the mandible inclines very steeply backwards to the angular process, in *L. flavopalliatus* there is no postarticular process, or but a trace of it, and the hinder margin slopes very gently to the angular process (*ag*), forming an angle of about 40° with the posterior part of the inferior margin of the ramus instead of one of about 60° as in *P. erithacus*.

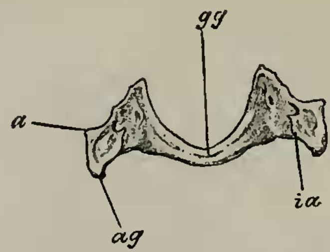
On the outer surface of the ramus there are in both species some small foramina, and a rather conspicuous one in *P. erithacus*. In that species also there is a considerable oval vacuity, or defect of ossification, at about the middle of the ramus dorso-ventrally, the middle of the vacuity being beneath the post-coronoid process. In *L. flavopalliatus*, however, the ramus is here entire but somewhat depressed or concave in this region. This depression is limited behind by a ridge which runs obliquely downwards and forwards from the articular process to the ventral margin of the ramus. This is only represented in *P. erithacus* by a prominence which runs downwards and forwards from the articular process for about half the breadth of the ramus. In *P. erithacus* a small foramen opens beneath the prearticular process at about one-fourth of the dorso-ventral diameter of the ramus from its dorsal margin. In *L. flavopalliatus* it opens a little behind that process and nearer the dorsal margin. Its external surface towards the angular process is slightly concave in both species, rather more so in *L. flavopalliatus*.

In *L. flavopalliatus* the inner surface of each ramus presents two elongated concavities separated by a ridge. At its anterior end this ridge curves sharply upwards, being also there most prominent, and approaching near to the coronoid process. Just behind its upwardly bent part a conspicuous foramen leads into the substance of the mandible. At its posterior end this ridge joins the outer margin of the larger articular surface for the quadrate, at the same time bounding externally a small but deep fossa which is situated outside the front part of that surface. In *P. erithacus* the conditions are similar save that the ascending anterior part of the ridge is the most conspicuous and ascends completely to the coronoid process, and that the foramen behind it is less conspicuous, opening on the front margin of the defect of ossification (which interrupts the internal longitudinal ridge); when the defect of ossification is smaller, the foramen opens beneath it. In both species the small foramen beneath or near the prearticular process opens into the superior longitudinal concavity of the inner surface of the ramus.

In both species also the larger articular surface for the quadrate is in the form of an antero-posterior, nearly straight groove. This groove is broadest at its anterior end in *P. erithacus*, but hardly at all broader there in *L. flavopalliatus*. On its inner side there is a small surface of bone, broadening gradually backwards, at the hinder end of which is a foramen. This is the innermost part of a subquadrate bony process, the internal articular process (*ia*), which projects nearly horizontally inwards and supports the outer part of the longitudinal articular groove.

The smaller and superior articular surface for the quadrate (*sa*) is on the inner side of the somewhat everted coronoid process. It is nearly straight antero-posteriorly, but strongly convex dorso-

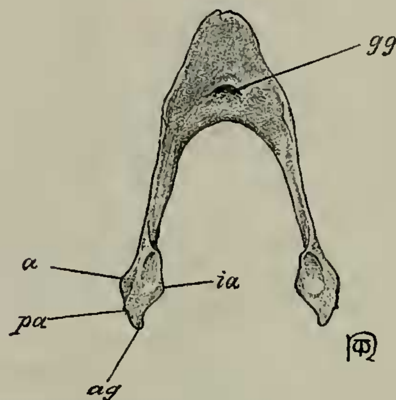
Fig. 15.



Postaxial aspect of mandible of *Lorius flavopalliatus.*

a. Articular prominence.
ag. Angular process.
gg. Fossa for genioglossus.
ia. Internal articular process.

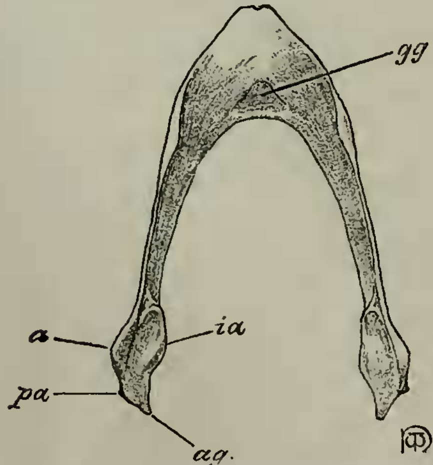
Fig. 16.



Dorsal aspect of mandible of *Lorius flavopalliatu*

a. Articular prominence.
ag. Angular process.
gg. Fossa for genioglossus.
ia. Internal articular process.
pa. Postarticular process. (Quite rudimentary in this species.)

Fig. 17.

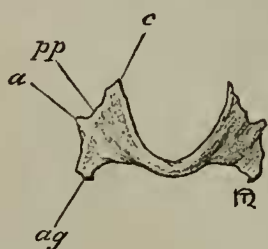


Dorsal aspect of mandible of *Psittacus erithacus.*
(Lettering the same as in fig. 16.)

ventrally. This is the surface which articulates with part of the zygomatic process of the quadrate as before described [1].

From beneath the hinder end of the internal angular process a strong ridge runs backwards, downwards, and outwards to the angular process (*ag*). The apex of this process is bent more inwards in *P. erithacus* and is relatively shorter. It is longer and its dorsal surface presents more of a concavity in *L. flavopalliatus*.

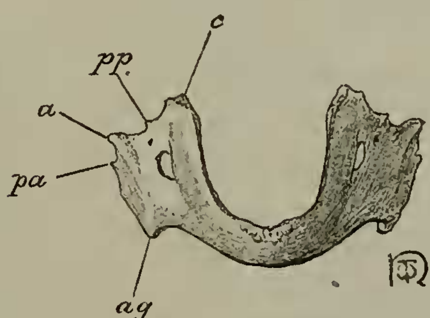
Fig. 18.



Preaxial aspect of mandible of *Lorius flavopalliatus*.

a. Articular prominence.
ag. Angular process.
c. Coronoid process.
pa. Postarticular process.
pp. Prearticular process.

Fig. 19.



Preaxial aspect of mandible of *Psittacus erithacus*.

(Lettering the same as in fig. 18.)

The mandible viewed in front shows the antero-dorsal margin in *L. flavopalliatus* in the form of an inverted pointed arch, an angular process extending much ventrad, and an apparently very slender transverse bony bar at the symphysis. In *P. erithacus* this bar is much stouter, the angular process less extended ventrad, and the antero-dorsal margin resembles an elliptical arch inverted; the defect of ossification in each ramus is also conspicuous.

[1] See above, p. 374.

Dimensions of the Skull.

	Lorius.	*Psittacus.*
Length of prosopium from its apex to the middle of the joint which unites it with the cranium (measured along its dorsal curvature)	2·9	4·0
The same measured in a straight line	2·5	3·4
Length of cranium from cranio-facial joint to the mid-dorsal margin of the foramen magnum (measured along its dorsal curvature)	5·1	6·0
The same measured in a straight line	3·6	4·2
Length from apex of prosopium to middle of hinder margin of bony palate	1·4	1·8
From middle of one maxillo-palatine junction to hinder end of lateral margin of prosopium of the same side	·7	·7
Breadth of palate at line of maxillo-palatine junctions	1·0	1·4
Breadth of cranio-facial hinge-joint on dorsum of skull	1·2	1·7
Length from apex of prosopium to its lateral notch (measured along the curve)	·8	1·2
The same measured in a straight line	·7	1·0
Length from lateral notch to hinder end of lateral margin of prosopium	1·2	1·4
Its greatest height of bony beak	1·1	1·4
From its ventral margin to nearest margin of nasal opening vertically above it	·7	·9
Height of its dorsum above the dorsal margin of the nasal aperture	·05	·05
Antero-posterior extent of nasal aperture	·55	·6
Measurement at right angles to the above	·48	·6
Least interval between adjacent margins of nasal apertures	·1	·5
From posterior end of lateral margin of prosopium to its lachrymal process	1·0	1·2
Greatest height of frontal above lachrymal process	·14	·2
Height of jugal at its junction with maxilla	·15	·35
Length of zygoma	2·3	3·1
Length of pterygoid	1·3	1·7
Greatest axial diameter of orbit	1·5	1·7
From dorsal margin of orbit to ventral margin of zygoma taken at right angles to cranial axis	1·7	1·9
From apex of frontal nasal process to distal end of lachrymal	1·9	1·7
From apex of lachymal to apex of sphenotic process	·25	·8
From apex of lachrymal to that of postorbital process	·8	1·2
From apex of postorbital process to that of sphenotic process	·75	·8
From apex of sphenotic process to postaxial margin of the meatus auditorius externus	1·1	1·3
From dorsum of quadrato-jugal articulation to apex of suprameatal process	·55	·7
From dorsum of quadrato-jugal articulation to the greatest prominence beneath it of the ventral articular surface of quadrate	·5	·7

Dimensions of the Skull (continued).

	Lorius.	*Psittacus.*
Length of the cranial articular process of quadrate...	·45	·6
From suprameatal process to apex of paroccipital process	1·0	1·3
From quadrato-jugal articulation to apex of paroccipital process	·9	1·0
From apex of paroccipital process to exoccipital process	·7	·8
Length from middle of cranio-facial articulation of dorsum of skull to vertical plane of apex of prosopium	1·6	2·1
Length from the same point back to the vertical plane of the greatest convexity of occiput	3·5	4·3
Least interorbital breadth	1·9	2·6
Greatest antorbital breadth	2·2	2·9
Greatest postorbital breadth	2·65	3·2
From greatest parietal prominence of one side to that of the other	2·5	2·9
Length of orbit as seen on the skull's dorsal aspect ...	1·5	2·7
Supero-anterior margin of palatine	·9	1·0
Postero-inferior margin of palatine	·55	1·5
Postero-inferior margin of palatine (in straight line)	1·55	2·2
Postero-superior margin of palatine to base of process	·7	1·7
Length of postaxial process	·1	·3
Length of interorbital septum in front of palatine ...	·4	·4
Length of palatine junction with cranium	·6	·8
Length of *basis cranii* from postaxial end of junction of palatine with cranium to eustachian aperture .	·9	·6
Length from preaxial margin of occipital condyle to postaxial mid-junction of pterygoids	1·8	1·8
Length of opening in septum for exit of olfactory nerve	·5	·8
Breadth of that aperture	·4	·3
Length of obscure ridge extending from process external to small orbital foramina to postorbital process	1·1	1·0
From apex of bony beak to middle of lambdoidal ridge (in a straight line), ventral surface of skull being regarded	4·9	6·0
From apex of bony beak to posterior end of palate...	1·3	1·7
From posterior end of middle of posterior margin of palate to front base of occipital condyle	3·2	3·7
Extreme length of palatine from margin of palate to end of palatine postaxial process	1·9	2·65
Breadth between the insides of the two quadrato-pterygoid articulations	1·5	2·0
Breadth between the insides of the two quadrato-jugal articulations	2·1	3·1
Breadth between the posterior apices of the two quadrates	2·1	2·6
Breadth between the posterior apices of the two paroccipital processes	1·6	2·2
Breadth of foramen magnum	·6	·8
Antero-posterior extent of ditto	·55	·7

Dimensions of the Skull (continued).

	Lorius.	*Psittacus.*
Length from posterior margin of palate to preaxial end of junction of palatines	1·1	1·2
From apex of paroccipital process to middle point of lambdoidal ridge	1·5	1·8
From exoccipital process to middle point of lambdoidal ridge	1·1	1·3
From mid-dorsal point of foramen magnum to middle point of lambdoidal ridge	·5	·8
Length from apex of mandible to end of angular process (measured along one ramus)	3·6	4·7
Length of symphysis	1·2	1·2
From apex of mandible to dentary process (measured in a straight line)	·5	1·5
From dentary process to coronoid process	·5	·8
From coronoid process to post-coronoid process	·6	·5
From post-coronoid process to prearticmlar process	·6	1·0
From prearticular process to anterior end of articular surface	·65	·8
From preaxial end of articular process to post-articular process	·5	·9
From post-articular process to angular process	·55	·8
Antero-posterior extent of defect of ossification	none	·5
Dorso-ventral extent of ditto	none	·3
Breadth of fossa for *genioglossi*	·2	·4
Length of articular glenoid groove to quadrate	·6	·8
Breadth of ditto	·22	·3

	Lorius domicella.	*Psittacus erithacus.*
Total length of basi- and urohyals from apex of rostrum to posterior end of urohyal	1·6	1·9
Extreme length of basihyal	1·1	1·1
Its breadth at junction with ceratohyals	·20	·20
Length of urohyal	·3	·70
Breadth of quadrate plate of basihyal at origin of uncinate outgrowths	·3	·48
Its breadth at hinder end	·4	·61
Length of entoglossum	1·0	1·0
Breadth of ditto	·4	·55
Length of basibranchial	2·0	2·10
Breadth of its proximal end	·2	·30
Length of cerato-branchial	·4	·50
Its greatest breadth	·15	·22

Angles of Skull.

	L. flavopalliatus.	*Psittacus.*
Angle of divergence sides of bony beak (seen dorsally)	50°	40°
Angle between sides of cranium from outer end of cranio-facial articulation to most prominent points of postorbital prominences	95	80
Angle to which dorsal margin of orbit approximates when seen from above	120	140
Angle formed by pterygoid with postero-superior margin of palatine	15	35
Angle formed by the line of junction of palatine to cranium with the postero-superior margin of palatine behind that junction	125	150
Angle formed by line of junction of palatine with *basis cranii* behind that junction	170	160
Angle formed by inferior margin of the *basis cranii* with the antero-inferior margin of interorbital septum just in front of its junction with the palatines up to septal process	155	140
Angle of divergence of palatines when skull is viewed from behind	25	23
Angle of divergence of zygomata	35	35
Angle of divergence of pterygoids	85	72
Angle of divergence of palatines when skull is viewed on its ventral surface	...	18
Angle between the antero-superior and the antero-inferior margins of palatine	30	25
Angle between the antero-inferior and the postero-inferior margin of palatine, postaxial process not being taken into account	90	95
Angle of preaxiad divergence of zygoma and pterygoid	25	25
Angle formed by inner and postero-external surfaces of quadrate	72	58
Angle of divergence of mandibular rami	32	32
Angle of oblique line on mandible marking limit of horny beak and ventral margin of the mandible	120	120

Distinctive Cranial Characters of L. flavopalliatus *from* P. erithacus.

In *L. flavopalliatus*:—

(1) Cranium more flattened.
(2) Prosopium more slender and elongated.
(3) Orbit more enclosed by bone.
(4) Palatines extend less ventrad compared with quadrates.
(5) Occiput less rounded and more inclined preaxiad above lambdoidal ridge.

(6) Paroccipital processes more sharply inclined backwards.
(7) More distinct from relatively smaller quadrates.
(8) Orbits more deeply incised dorsally.
(9) Prosopium in front of nares at first less sloped, afterwards more sharply so.
(10) Nostrils look more dorsad and are larger.
(11) No excavation in front of each.
(12) Internasal space narrower.
(13) Hindermost part of tomial margin concave.
(14) Margin above suprajugular process usually straight.
(15) Lachrymal process of prosopium minute and almost on a line with dorsum of cranium.
(16) Prosopial angle 50°.
(17) Bony palate more concave.
(18) Its free median hinder margin as long as the two palatal articulations conjoined.
(19) Lateral palatal processes ventrally grooved.
(20) Preaxial end of zygoma less dorso-ventrally expanded.
(21) Ventral margin of palatines more concave.
(22) Posterio-inferior angle more prominent.
(23) Posterior palatine process very much shorter.
(24) Lachrymal nearly reaches sphenotic.
(25) An ectosphenotic process.
(26) Meatus auditorius externus limited in front by a delicate lamella behind quadrate column.
(27) Posterior margin of meatus auditorius externus concave at upper two-thirds, slightly convex below this.
(28) Posterior part of body of quadrate smaller.
(29) Antero-posterior groove outside lachrymal very marked.
(30) Mesiad inflated part of palatine more considerable.
(31) Precondyloid fossa deep.
(32) Posterior margin of basipterygoid shield like a wide letter M.
(33) Infero-external surface of paroccipital process strongly concave transversely.
(34) Quadrate column longer and more slender.
(35) Geniohyoid fossa more marked and relatively nearer to the postaxial margin of symphysis.
(36) No ramal defect of ossification.
(37) Symphysis relatively much longer.
(38) Mandible less concave from apex to dentary process.
(39) Rami and symphysis form together a pointed arch.
(40) Ramus narrows more gradually backwards.
(41) Margin between prearticular and coronoid processes shorter and steeper.
(42) Margin between coronoid and postcoronoid processes longer and less concave.
(43) No postarticular process.

Eos rubra appears to agree with *Lorius flavopalliatus* in all the above points except—

1. Apex of prosopium not so much bent down though more so than in *P. erithacus*.
2. Prosopium longer and slenderer because its relative dorso-ventral extent in front of nares is less.
3. Anterior palatine foramen much larger.
4. Mid-junction of palatines antero-posteriorly shorter.
5. Posterior margin of palatines less concave.
6. Postero-ventral angle more produced and much sharper than in either *L. flavopalliatus* or *P. erithacus*.
7. No marked prequadrate process of sphenotic process.
8. No concavity at hinder end of tomial margin.
9. Middle of postaxial margin of bony palate more prominent—almost a process.
10. Cranium, seen above, longer and narrower.
11. Distinct antero-posteriorly extending transverse concavity in parietal region.
12. Prosopium, seen above, much longer.
13. Interorbital extent of cranium narrower absolutely and relatively.
14. Paroccipital processes rather less projecting postaxiad and their apices mesiad.
15. Median ridge of ventral aspect of prosopium behind bony palate much more marked.
16. Postaxial margin of prosopium between zygoma and lachrymal process rather more extensive and more concave.
17. Median supraoccipital prominence less marked.
18. Bony symphysis of mandible relatively as well as absolutely shorter.
19. Projection mesiad of inner articular process of mandible rather less.
20. Arch of symphysis (mandible being viewed from beneath) more acute—much as in *P. erithacus*.
21. Apices of angular processes rather more inflected mesiad.
22. Tomial margin between apex of symphysis and dental process slightly more concave.